ENGINEERING AND MINING JOURNAL

A McGRAW-HILL PUBLICATION

SEPTEMBER 1952

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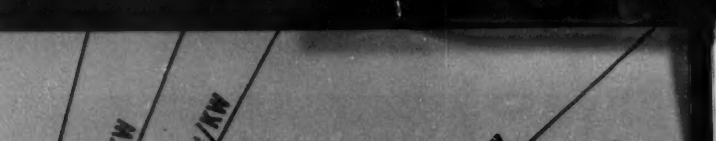
FOUNDED 1866

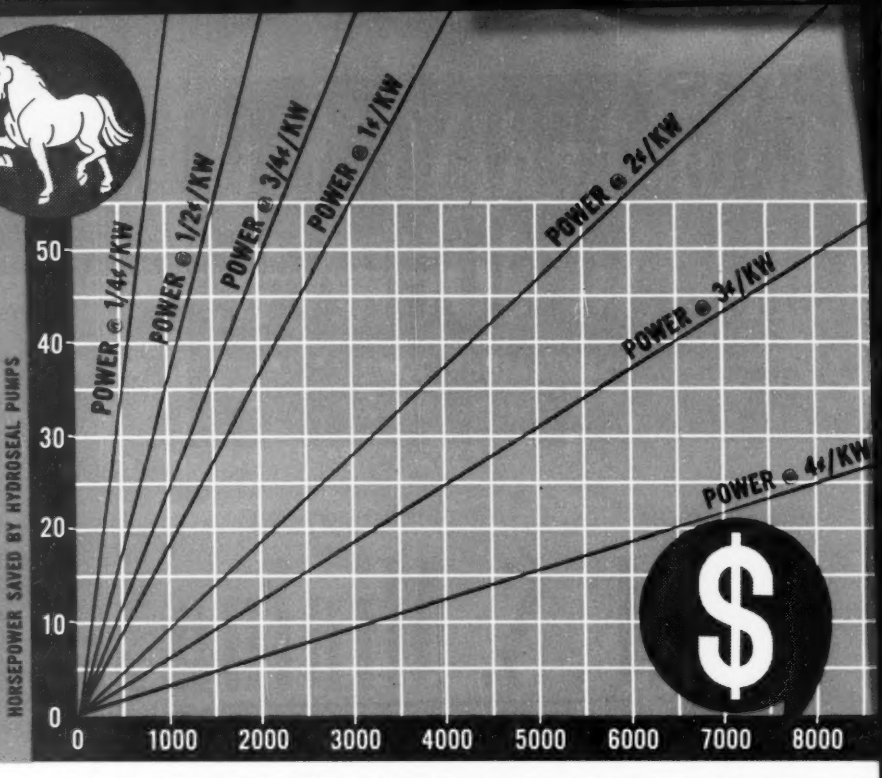
U.S. Mining... Today and Tomorrow

A Two-Billion-Dollar Growth by 1956... P. 88

Demand for Minerals Up 90% by 1975... P. 90

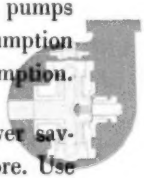


How much can you save?

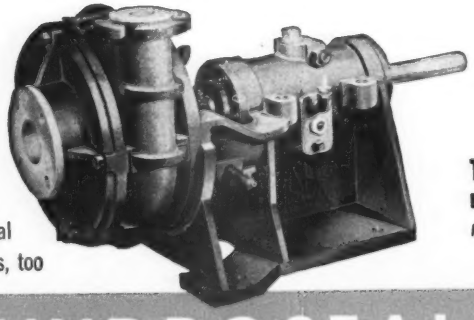


DOLLARS SAVED PER YEAR BY HYDROSEAL PUMPS BASED ON 24 HOURS PER DAY–300 DAYS PER YEAR

Because clear sealing water is always flowing into the volute and suction eye of the impeller of Hydroseals, abrasives are kept out of vital areas. This eliminates "double pumping" of material, and gives high initial efficiency which is maintained substantially throughout pump life. Oversized pumps and motors are unnecessary—the initial power consumption of the pump is just about the average power consumption.



All this adds up to significant power savings, often as much as 25% or more. Use the simplified chart shown to figure your own savings with Hydroseals. Write for Catalog No. 552 for complete information.



Vertical pumps, too

THE ALLEN-SHERMAN-HOFF PUMP CO.
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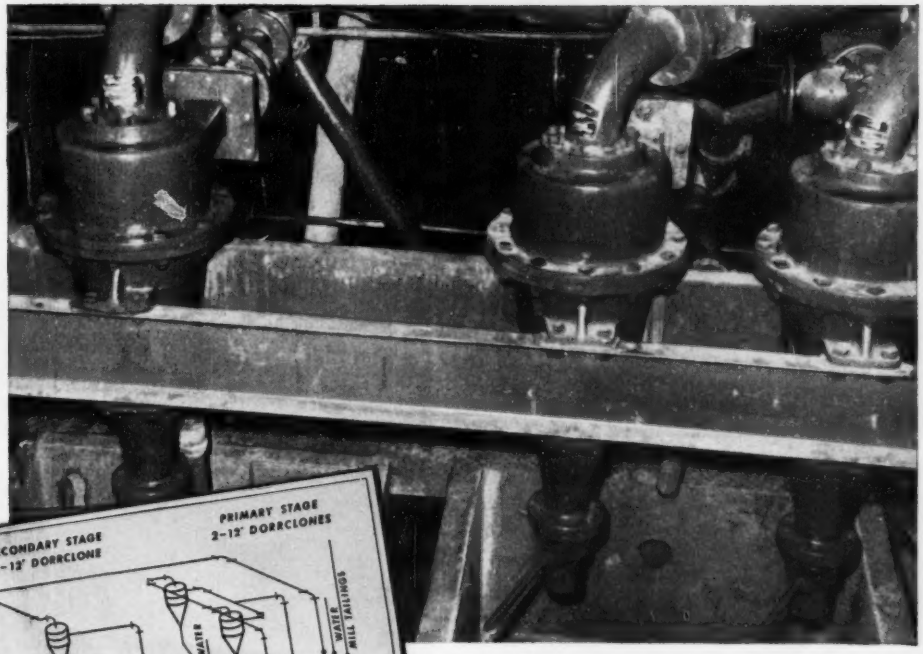
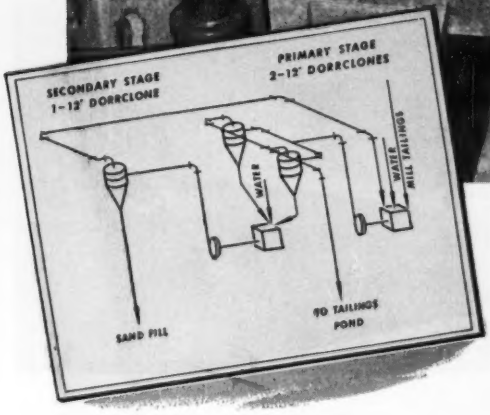
HYDROSEAL

SAND, SLURRY & DREDGE PUMPS
MAXIMIX RUBBER PROTECTED

HYDROSEAL, PACKLESS AND MAXIMIX DESIGNS ARE COVERED BY PATENTS AND APPLICATIONS IN THE MAJOR MINING CENTERS OF THE WORLD





For Producing Mine Backfill From Mill Tailings...

Madsen Red Lake Gold Mines uses two stages of DorrClones for maximum flexibility*

From a 3" test DorrClone to the installation of three 12" dia. units. That's the story at Madsen Red Lake, one of Canada's most modern gold producers. Using a two-stage flowsheet as shown in the accompanying sketch, the DorrClones are producing 120 tons per day of fill with a percolation rate of 4-6 in/hr.

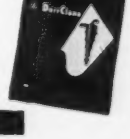
Key to this two-stage DorrClone setup is flexibility. While the units are in continuous operation, simple adjustments can be made to produce any type of fill from practically any composition of mill tailings. To illustrate this flexibility, three tests were made at Madsen Red Lake yielding the following results:

*T.M. Reg. U. S. Pat. Off.

	TEST A	TEST B	TEST C
New feed to primary stage, TPD	330	298	330
% solids to DorrClones	.....	21.2	21.4
Sand Fill Produced, TPD	251	167	120
% solids	49.5	57.0	62.5
Percolation rate, in. per hr.	2.75	6.75	11.5

(Tests were made consecutively without shut-down)

Regardless of your particular mining operation, tailings composition or fill requirements, The DorrClone is an ideal tool with which to solve backfill problems. Write for a copy of bulletin No. 2500 to The Dorr Company, Stamford, Conn., or in Canada, to The Dorr Company, 80 Richmond Street West, Toronto 1.



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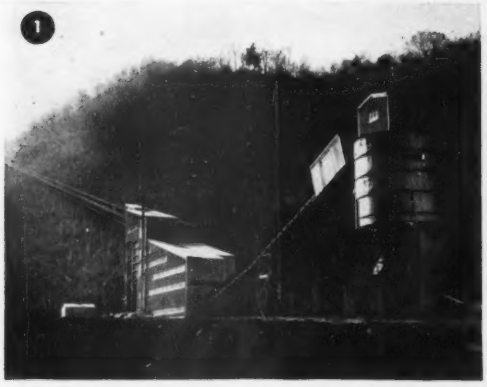
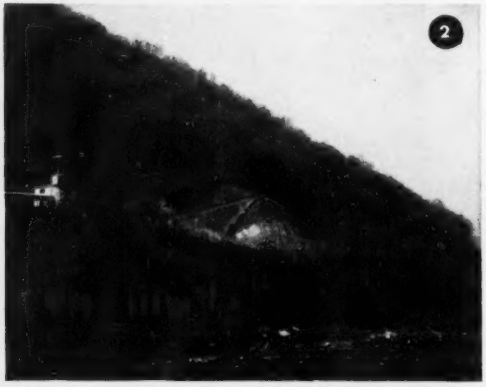
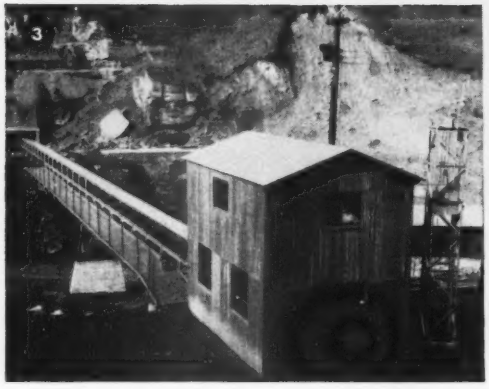
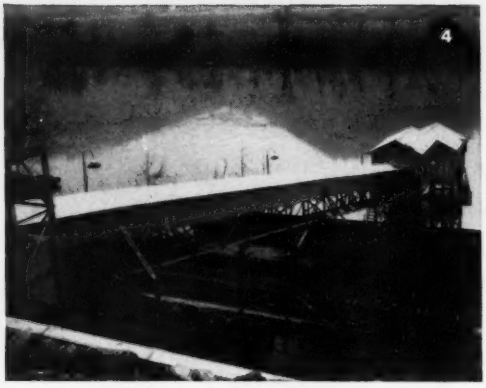
RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER









Where coal rides a roller coaster

B. F. Goodrich beltroad cuts conveying costs per ton

MANY coal mines are located up in the mountains, miles from low-cost transportation. In this case, three mountains stand between the mine and the river. But the four pictures above show how B. F. Goodrich engineers helped solve the problem.

A series of nine conveyor belts was designed to carry 350 tons of coal per hour down the first mountain (1), snake it across country around another mountain (2), shoot it through a mile-long tunnel in the third mountain (3), to the point where it finally emerges at the river's edge (4)—a roller coaster ride more than 2½ miles long.

In choosing the belts, B. F. Goodrich engineers knew the ordinary type could not handle the entire job because of the heavy impact when the coal and rock are dumped onto the belt at the top of the slope. The belt recommended for this tough work was the B. F. Goodrich *cord* belt, so-called because it's reinforced with individual cords which run lengthwise. Each cord is completely surrounded by rubber. No cross threads tie them together—so they are free to give as heavy chunks of coal strike the belt. The rubber takes the shock.

B. F. Goodrich developed this cord belt years ago, and has since made many improvements that make it first choice for many really tough jobs. One such improvement is "balanced construction". Now the layers of individual cords are built into *both* the top and bottom of the belt to give even greater impact resistance. Other construction features provide for proper troughing whether belt is empty, lightly or fully loaded, and permit longer centers, higher lifts to be used.

No matter what type or size of material you have to move, there's a B. F. Goodrich conveyor belt that can do it better, for less. Your local BFG distributor can show you how these longer-lasting belts can save you money, or write *The B. F. Goodrich Company, Industrial & General Products Division, Akron, Ohio.* (Available in Canada)

Conveyor Belts BY
B.F.Goodrich
RUBBER FOR INDUSTRY

ENGINEERING AND MINING JOURNAL

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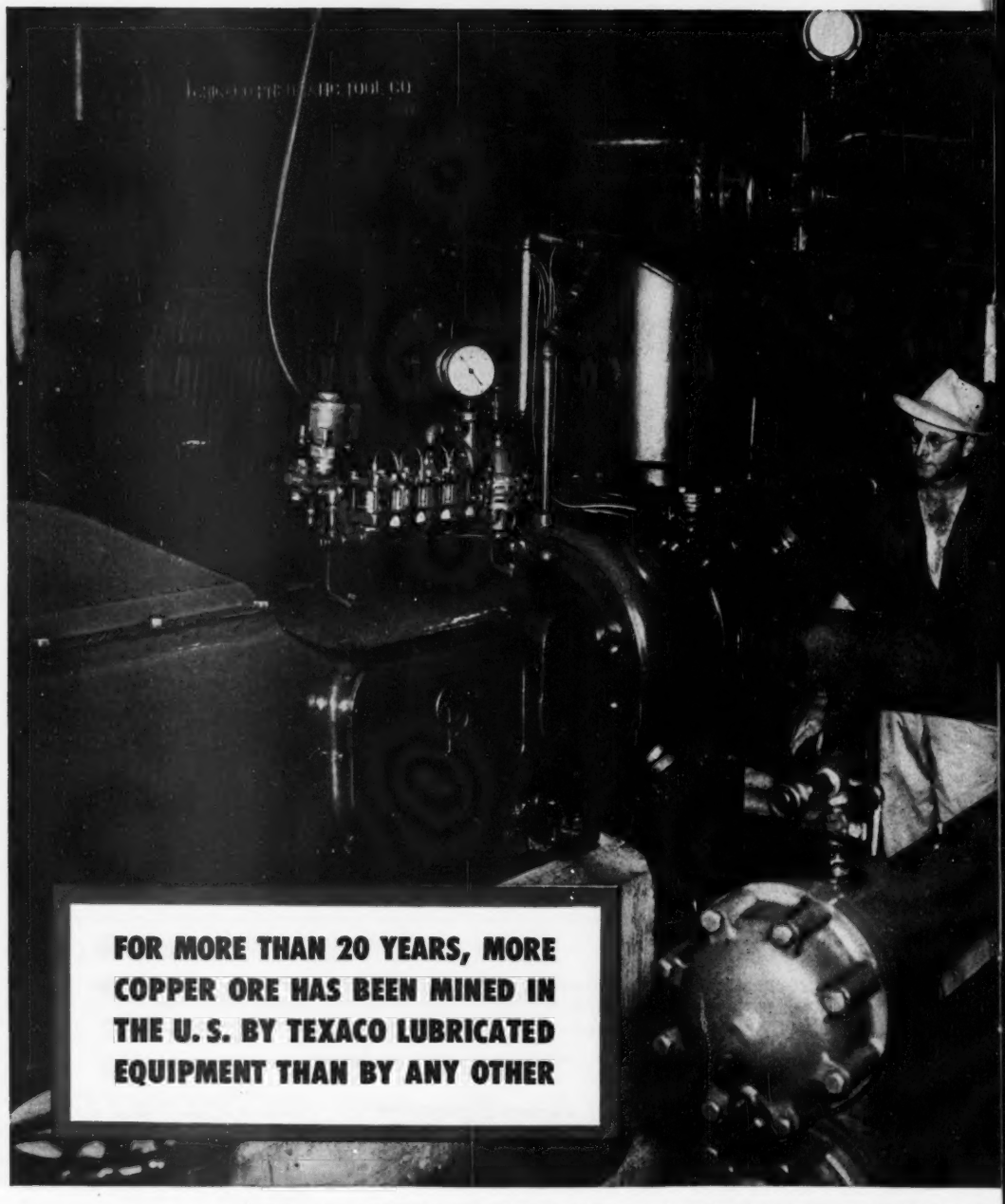

TUNE IN:
On television —
the TEXACO STAR THEATER
starring MILTON BERLE.

See newspaper for
time and station.

TEXACO

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Use the Texaco air compressor oil best suited to your operating conditions

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For your drills, use *Texaco Rock Drill Lubricant EP*. It's an "extreme pressure" lubricant that gives high protection against wear and prevents rust whether drills are running or idle.

Call in a Texaco Lubrication Engineer and let him help you get better performance from all your equipment. Just contact the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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No body-hoist

GRAVITY DUMP cuts maintenance costs... speeds haul cycles

Koehring Dumptors have no slow-working body hoists. Trip the release lever and gravity dumps the 6-yard load in one second. It's as simple as that! No complicated mechanical hoists to slow up haul cycles . . . no expensive replacement parts, costly hoist maintenance or down time to eat into your profits. And gravity dump is instantaneous and trouble-free in all temperature extremes . . . never wears out.

No costly spring maintenance is another money-saving advantage you get with Koehring Dumptors. There is just one big, double-coil chassis spring on steering axle . . . none on driving axle. Extra-big, shock-absorbing drive tires eliminate need for more. You save spring maintenance time and replacement costs.

Check your body hoist and spring maintenance costs for a year . . . see how much you'll save by using Dumptors. What's more, Dumptor's no-turn shuttle haul and constant-mesh transmission for 3-speed travel forward and reverse, increases production . . . and your profits. See your Koehring distributor now for all the facts . . . or send today for informative 28-page Dumptor catalog.

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K120

KOEHRING DUMPTOR®
CRANES UP TO 79½ TONS LIFT CAPACITIES . . . EXCAVATORS UP TO 2½ YARDS

SIMPLE BODY-RELEASE LEVER WORKS *INSTANTANEOUSLY*

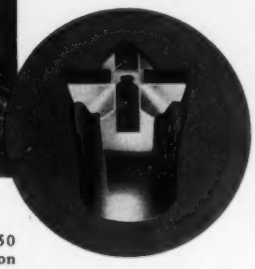
1 Body release lever is located at steering wheel, no reaching or stretching. Lever engages trip rod on Dumptor body . . .

2 Trip rod instantly releases latch hooks from body latch seat on the Dumptor chassis frame. Gravity dumps the load . . .

3 Body rolls on heavy-duty rockers. Snub chains attached to big coil-spring shock-absorbers check body at 70-degree tilt.

UNIVERSAL JACKDRILL

The JR-38 combines important new features never before available in an air-feed-leg unit. Can be used as a stoper—a drifter—or a Jackhamer. Gives new speed and convenience in setting up, collaring, drilling and hole blowing. Available with 2', 3' or 4' feed legs.

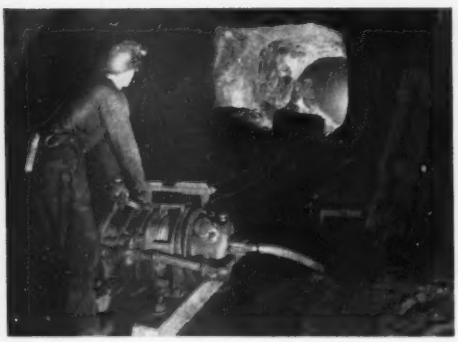


CARSET JACKBITS

Pioneered by Ingersoll-Rand the Carset Jackbit drills faster, has negligible gauge wear, practically eliminates bit changes, saves manhours all along the line.

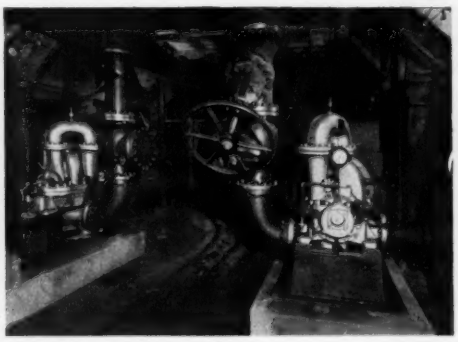
DRIFTERS

Light-weight D-50 Drifter Combination saves time and labor in small headings and flat-hole stoping. Includes powerful D-50 Drifter, fast PF-3 power feed, aluminum shell, aluminum alloy arm and clamps and pneumatic column.



SLUSHER HOISTS

I-R's complete line of highly efficient, low maintenance air or electric driven slusher and scraper units covers every requirement for underground or surface mining. The two-drum, air-powered unit shown above is used for scraping muck into a vertical raise approximately 220 ft from the face.



CENTRIFUGAL PUMPS

I-R centrifugal pumps have proved their outstanding economy and dependability under the most severe conditions of mine service. Each of the four-stage, 500 hp units shown handle 800 gpm at 1700 ft head in a centralized drainage system for a group of copper mines.

UNDERGROUND, OR . . .

every step of the way

INGERSOLL-RAND SPEEDS MINERAL PRODUCTION

... with over 80 years of specialized experience in serving the metal mining field

During this time Ingersoll-Rand has developed and perfected an extensive line of specialized mining equipment. Our worldwide staff of field and factory engineers has acquired an unequalled background of experience in meeting and overcoming the countless production problems entailed in mining.

This wealth of experience, and this complete line of proven equipment, are at your service. Whatever the problem, your Ingersoll-Rand representative may be able to help you find the one *best solution*—be it equipment, application engineering or field service.

DON'T MISS THE I-R EXHIBIT AT THE METAL MINING SHOW!

September 22-25—City Auditorium, Denver, Colorado. Located to the left of the Main Entrance on entering the building, Booth 201

- ROCK DRILLS
- COMPRESSORS
- AIR TOOLS
- TURBO BLOWERS
- CONDENSERS
- CENTRIFUGAL PUMPS
- DIESEL AND GAS ENGINES

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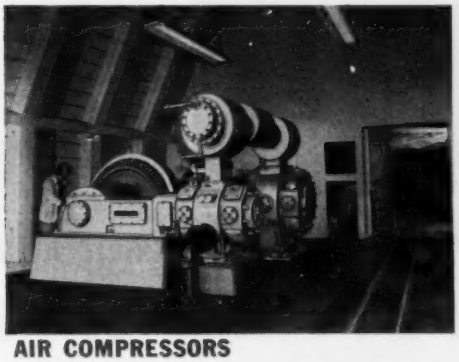


AIR COMPRESSORS

I-R stationary and portable compressors are preferred the world over as a source for dependable, low cost air power in mining service. The 400 hp PRE unit shown above is located underground, 6000 ft from the portal.

TURBO BLOWERS

I-R Turbo-Blowers have built an enviable performance record for long, trouble-free service in metal refining and smelting plants. The six units shown above, installed in a large copper converter plant, have a combined capacity of 157,000 cfm at 15 psi.

...ON THE SURFACE

IT'S JOY EQUIPMENT

Right: The Joy Drillmobile, a twin-boom, self-propelled, highly maneuverable machine, gives you maximum footage at least cost per foot of hole. Features Joy Hydro Drill Jibs for fast, accurate hole-positioning, and remote control.

Above: For high-production loading and haulage of rock and ore, Joy teams of trackless loaders and electric or diesel shuttle cars get the call underground.

Right: Complete range of Joy Stopers includes the new S-91T, with telescopic feed. Requires fewer steel changes, gives more time for drilling.

Below: Joy Wagon Drill specially adapted to drill at any height from toe-holes to horizontals 9' high.

Above: Joy Hydro Drill Jibs are versatile units; can be mounted as required to suit individual needs.

Left: The Joy HS-15 high speed drill for underground blast holes, or core drilling to 500'. Compact and easy handling, with "in-line" vibrationless drive.

DON'T MISS THE JOY EXHIBIT AT THE

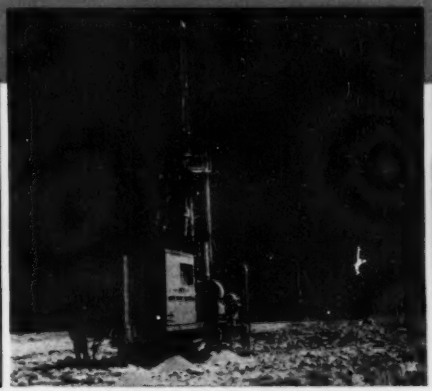
1952 MINING SHOW

For the best in mining equipment, see JOY—both in the Exhibition Hall and outside—at the Denver Show. The latest developments in equipment for drilling, loading, hauling, and prospecting are the nucleus for a display of the world's most modern types of mining machinery . . . for top production efficiency and lowest costs UNDERGROUND OR ON THE SURFACE.

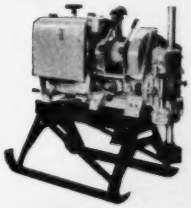
FOR GREATER TONNAGE FOR LOWER COSTS

Above: Joy builds a complete line of "Silver Streak" Hand Tools, cadmium-plated for rust protection and easier running in.

Above: Joy Wagon Drills (Medium and Lightweight models) are easily maneuvered units with positive locking brakes for quick set-ups and balanced drilling on any terrain.

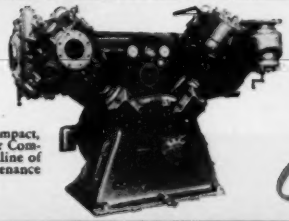


Above: Joy Champion Rotary Drills set absolutely new standards in high-speed, economical blast hole drilling, far outperforming all others. Built in two self-propelled models, for diesel, gasoline engine or electric motor drive.



Above: Joy Core Drills range in capacity from 250 to 1750 feet of 1¾" hole. Screw feed or hydraulic types—gasoline, diesel, air or electric drive.

Above: Joy Hydro Drill Jibs are readily adaptable to truck-mounting, etc. for secondary drilling or toe-holes in quarries or open-cut mining.



Left above: Joy's popular Series 80 Portable Compressors, with the famous "Econo-Miser" load control, are built in seven sizes, from 60 to 630 CFM.

Right: Joy pioneered the compact, modern "package-type" Air Compressor—offers a complete line of highly efficient, low maintenance airplants up to 3656 CFM.

Consult a Joy Engineer

W&D M-3363

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BATTERY

OUTSTANDING NEW FEATURES INCLUDING

the polyethylene insulating tube sealer combine to make Exide-Ironclad, *more than ever before*, YOUR BEST POWER BUY . . . AT ANY PRICE.

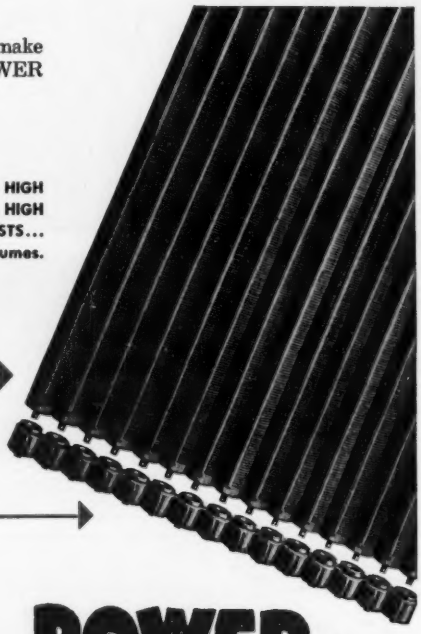
THE IMPROVED EXIDE-IRONCLAD IS BUILT TO GIVE YOU . . .

RAPID, HIGH PRODUCTION HAULAGE, more trips per shift . . . HIGH MAINTAINED VOLTAGE, with uniform speed to end of shift . . . HIGH AVAILABILITY . . . LOW OPERATING COSTS . . . LOW MAINTENANCE COSTS . . . LOW DEPRECIATION COSTS . . . SAFETY from hazards of fire and fumes.

BECAUSE OF . . .

IMPROVED POSITIVE PLATE CONSTRUCTION. The long-life grids now contain SILVIUM—an alloy of silver, lead and other components—which make them highly corrosion resistant.

. . . the New Polyethylene insulating tube sealer of acid-proof, non-corroding plastic. It fits snugly into slotted tubes of positive plate, and reduces loss of active material. Even the small sediment deposit of the past is reduced 50%. Thus more active material remains available, and the high battery capacity is maintained for a longer working life.



IMPROVED NEGATIVE PLATES for higher electrical efficiency.
NEW SEALING COMPOUND—provides permanent seal between jar and cover.
SEAMLESS SHOCK-PROOF JAR, of high quality rubber combines tensile strength and elongation for long-life and heavy-duty service.
NEW UNBREAKABLE PLASTIC VENT PLUGS of polyethylene.
TYPES, SIZES AND CAPACITIES for mine haulage units of every make.

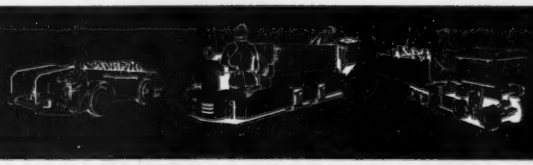
THE ELECTRIC STORAGE BATTERY CO.
Philadelphia 2
Exide Batteries of Canada, Limited, Toronto

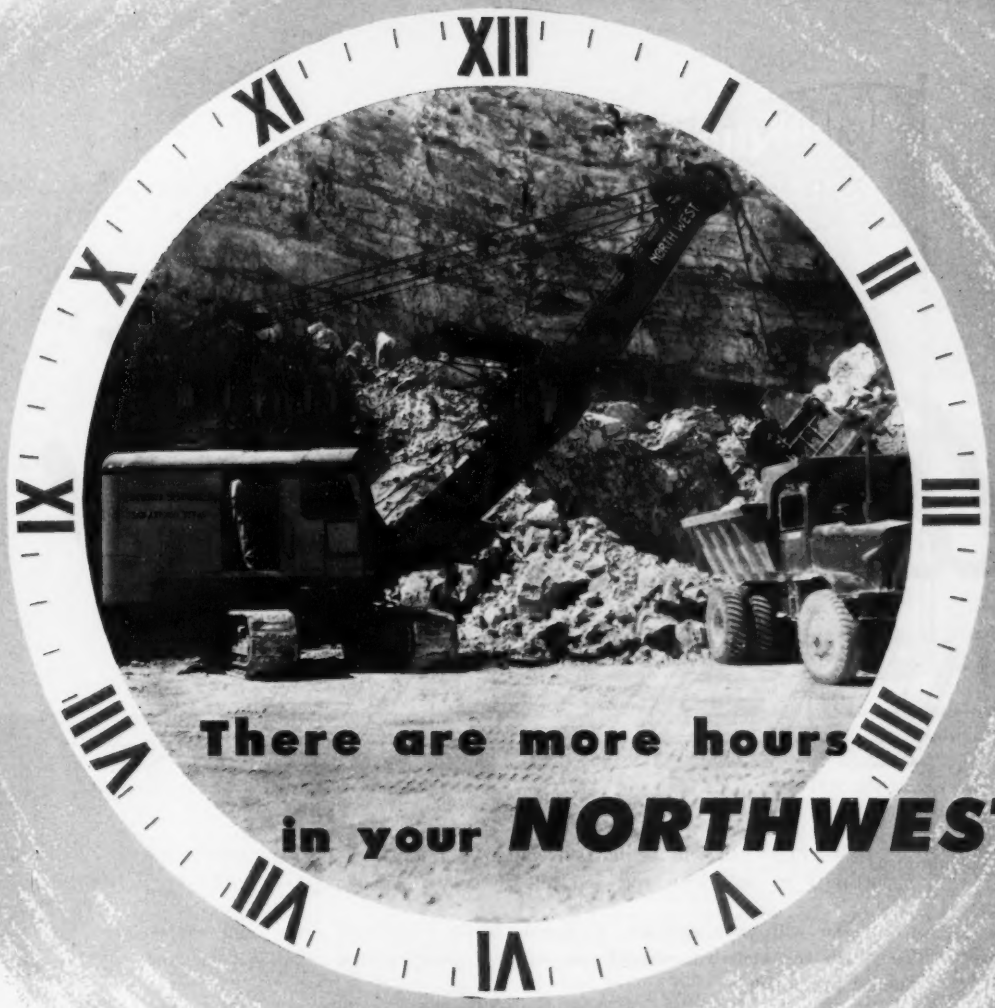
1888 . . . DEPENDABLE BATTERIES FOR 64 YEARS . . . 1952

"EXIDE-IRONCLAD" and "SILVIUM" *Reg. T.M. U.S. Pat. Off.*

VISIT EXIDE BOOTH 414
1952 Mining Show
Denver, Sept. 22-25

Exide-Ironclad
IS YOUR BEST POWER BUY
. . . AT ANY PRICE





There are more hours in your NORTHWEST!

See us at the
1952 MINING SHOW
Denver, Colorado
Booth 900

It's another
NORTHWEST

WHEN you buy a Northwest you are buying a *real* Rock Shovel—equipment built to meet the grinding punishment of the hardest kind of digging. Your Northwest is rugged and sturdy. It is designed and built to be easily cared for and service records in the hands of many contractors show that maintenance is at the minimum on Northwest machines.

There is a lot of talk of shortages—equipment may not be so easy to get. Keep your Northwest in good condition. There are more hours in your Northwest than a less efficient rig.

NORTHWEST ENGINEERING COMPANY
1509 Field Bldg., 135 South LaSalle Street, Chicago 3, Illinois

Yes Sir — We'll be there!

DENVER

We hope you will be in Denver too. We are looking forward to the opportunity to talk with you and tell you about Simplex products.

We will have samples of Simplex-TIREX portable cords and cables. They are the ones you should use on your electrically-operated portable and mobile equipment.

You can see samples of Simplex-ANHYDREX XX cables for your high voltage feeder circuits.

Of course Simplex - ANHYDREX cables rated for 600-volt operation for local feeder service will be on display.

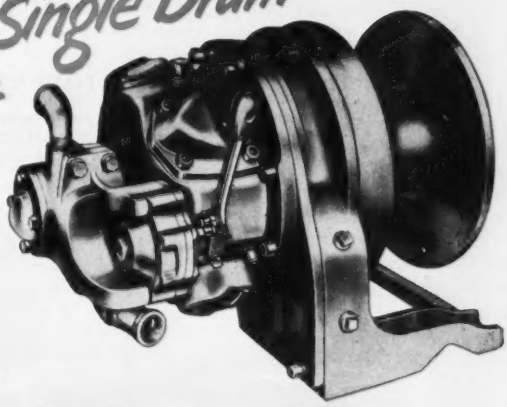
There will also be Simplex cables for control, communication and signal service that you will want to see. So be sure to stop in at the Simplex booth. We will be looking for you at Booth #327 in the Exhibition Hall.

Come to the 1952 Mining Show. It will be held in Denver at the City Auditorium, September 22 - 25.

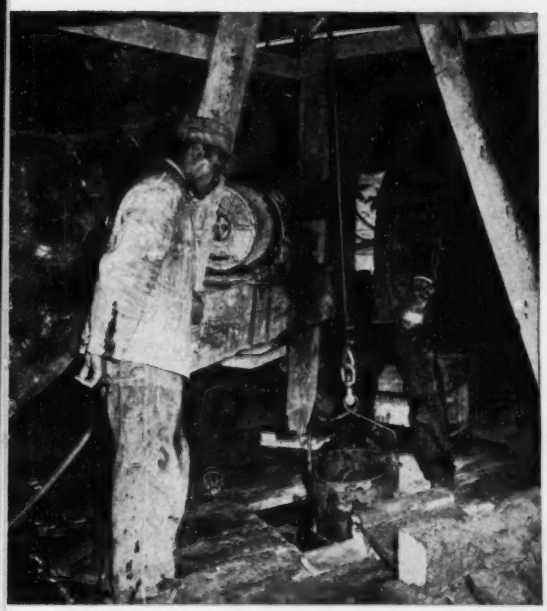
Simplex - WIRES & CABLES

SIMPLEX WIRE & CABLE CO.
79 SIDNEY STREET,
CAMBRIDGE 39, MASS.

The Most Powerful Single Drum Per Unit of Weight



JOY DW-111 PISTONAIR HOIST



Yes, the DW-111 develops more horsepower per unit of weight than any other hoist in its class. This is no idle boast. Take a look at the figures—

Hoist A	.0082 H.P. per pound
Hoist B	.0103 H.P. per pound
JOY DW-111	.0115 H.P. per pound

This superior power with light weight is the result of modern compact design—design which has been developed through many years of intimate knowledge of hoisting requirements—plus the proper use of modern materials to produce a sturdy, heavy-duty hoist which will stand up under years of hoisting service with a minimum of maintenance. The DW-111 reversible, compressed air driven hoist has a 1200-pound lifting capacity.

AUTOMATIC SAFETY BRAKE

Increases safety and simplifies operation

The exclusive Joy automatic safety brake positively holds the load in any position when the throttle valve is in the "off" position. And the throttle valve has a spring return to the "off" position—making certain that there can be no slip-up. It's foolproof.

Joy manufactures a complete line of single drum hoists, shaft hoists, and two-and three-drum slusher hoists in capacities to meet your hoisting needs. ● *Write for further information, or...*

W&D M 3798

Consult a Joy Engineer

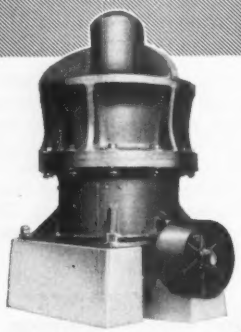
JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

Man is always inventing

new ways to do a job better . . . make work easier. This old timer by-passed back breaking labor with an ingenious rig to crush gold-bearing ore.



The Traylor TY Reduction Crusher incorporates maximum efficiency with easy maintenance for top performance on the job. Ask for Bulletin 6112 for complete details.

The mining industry is famous for its ingenuity in finding ways to speed production while obtaining a better product. For 50 years, Traylor has fostered this ability by constantly improving crushing machinery. As in the past, so in the future, each year brings new methods—and new problems—to the industry. Mining men know that experience is their best source for solving these problems. Traylor has experience . . . half a century of it.

OUR GOLDEN ANNIVERSARY YEAR

1902 1952

TRAYLOR ENGINEERING & MANUFACTURING CO.

1432 MILL ST., ALLENTOWN, PA.

SALES OFFICES: New York, Chicago, San Francisco

Canadian Mfr.: Canadian Vickers, Ltd., Montreal, P. Q.

a **Traylor** *leads to greater profits*

ELEVATION:
12,000 feet
PRODUCTION:
4 to 5 buckets per minute
POWER:
"Caterpillar" Diesel

THIS 3/4-yard Lorain Shovel is powered by a "Caterpillar" D318 Engine. The rig is owned by C. Ryan and Son, Lakewood, Colorado. Here you see it working near Climax at an elevation of 12,000 feet. It's loading molybdenum ore into trucks on the average of 4 to 5 buckets per minute. Lee Ryan says: "We use 'Cat' power almost exclusively because we can always depend on it—even at this extreme altitude."

More and more "Caterpillar" power is being specified for use in shovels and other mining equipment because—quoting Lee Ryan again—"you can depend on it." There's a good reason. "Cat" Diesel Engines are *built*—not assembled. Their outputs are *as advertised*—you can count on them to deliver full horsepower. They burn low-cost fuel without fouling. And they're practically foolproof to operate.

There's a "Caterpillar" Diesel to meet *your* requirements. These big yellow engines range in size from 52 HP to 500 HP. For complete *facts* about them, see your nearby "Caterpillar" Dealer. Ask him to show you records of their performance in the mining field. That's the best way of measuring what you can expect from them in your equipment!

CATERPILLAR, PEORIA, ILLINOIS

CATERPILLAR
REG. U. S. PAT. OFF.

DIESEL ENGINES
TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT

BUCYRUS ERIE

6-YARD

150-B

Brings NEW SPEED, POWER, CAPACITY

To Loading and Stripping

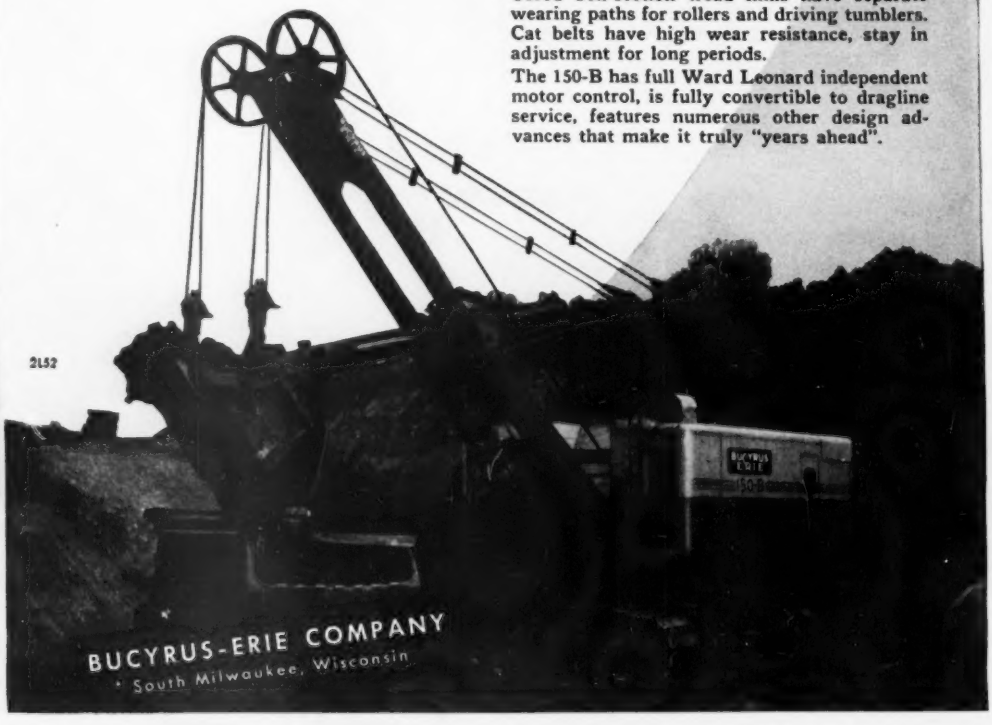
ADDED to the time-proved superiorities of design and construction which have made Bucyrus-Erie quarry and mining shovels traditionally "years ahead" are important features new to an excavator of this size, yet *thoroughly proved in the field*. Among these 150-B features are:

Exclusive Two-Section Boom with tubular dipper handle free to rotate in saddle block. Used with outstanding success on Bucyrus-Erie's large stripping shovels for many years, this design speeds the working cycle and permits increasing the payload because it reduces front end weight materially — yet provides enormous strength. Upper boom section carries only load resulting from pull of ropes, strong trussed lower section transmits directly to the revolving frame the vibrations, torsional and shock loads set up in digging. Rope crowd is quiet, positive, with crowd machinery located on the deck.

Powerful New Main Machinery designed for double twin hoist, smoothly delivers power where you want it, when you want it. Hoist machinery pulls dipper straight through tough banks with steady positive action. Fast smooth swing, with quick acceleration and deceleration, shaves seconds off every cycle.

Larger Stronger Mounting has new propelling machinery arrangement, which provides rapid engagement of the propel for fast move ups. Cored box-section tread links have separate wearing paths for rollers and driving tumblers. Cat belts have high wear resistance, stay in adjustment for long periods.

The 150-B has full Ward Leonard independent motor control, is fully convertible to dragline service, features numerous other design advances that make it truly "years ahead".



BUCYRUS-ERIE COMPANY
South Milwaukee, Wisconsin

Tough answer to a *Tough* problem

A SUPER-BRIGHT RED COVER AIR HOSE

EVEN in the most rugged hose service — direct connection to compressors in mines, quarries and construction operations — you can depend on REDWING-H Cord Air Hose for longest, trouble-free service.

That's because this hose was developed by the G.T.M. — Goodyear Technical Man — to take hard knocks in stride. Everything from its oil-resistant tube to the red cover of tough, resilient stock adds up to long life at lowest over-all cost.

Ask the G.T.M. about REDWING-H Cord Air Hose for your tough jobs. Or see your nearest Goodyear Industrial Rubber Products Distributor. Available in continuous lengths, for working pressures from 200 to 350 lbs. psi maximum; sizes from ½" to 1½" I.D.

GOODYEAR INDUSTRIAL RUBBER PRODUCTS
-Specified
REDWING-H CORD AIR HOSE
A
B
C
A—synthetic tube is seamless, nonporous, non-flaking, oil-resistant
B—two or three braids of high-strength rayon reinforce against shock blows
C—red cover of heavy, resilient stock bounces away abrasion, cuts, gouges

LOOK FOR YOUR GOODYEAR INDUSTRIAL RUBBER PRODUCTS DISTRIBUTOR *in the yellow pages of your Telephone Directory under "Rubber Products" or "Rubber Goods." He handles Hose, Flat Belts, V-Belts, Molded Goods, Packing, Tank Lining, Rubber-Covered Rolls built to the world's highest standard of quality.*

GOODYEAR

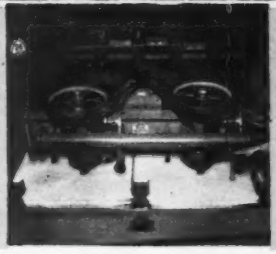
THE GREATEST NAME IN RUBBER

Redwing—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

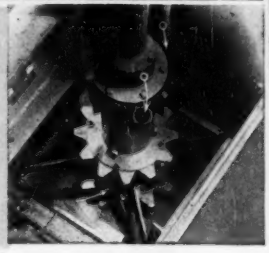
ILINGS yesterday
. because of [illegible] price of metal.

New Denver "Sub-A"
Super Rougher Flotation Machine
in roughing circuits aids in
getting values which are now
profitable with higher prices!

The Denver "Sub-A" Super Rougher Flotation Machine
features a low pulp level, adjustable froth depth and double overflow so froth may be quickly discharged before bubbles drop their load. Photo shows a 2-cell, No. 18 Sp. (32x32) Denver "Sub-A" Super Rougher Flotation Machine, filled with water. Depth of water is 18". Intense agitation and aeration raises froth to 26", a deep froth of 8"



Controlled feed
to the agitation chambers add to the flexibility of the unit. Feed to agitating chamber is regulated by rubber bushing to meet ideal flotation conditions. An adjustable sand relief opening is placed low in the cell. Pulp level is adjusted by a handwheel weir gate at the end of every two cells. This is a double impeller mechanism.

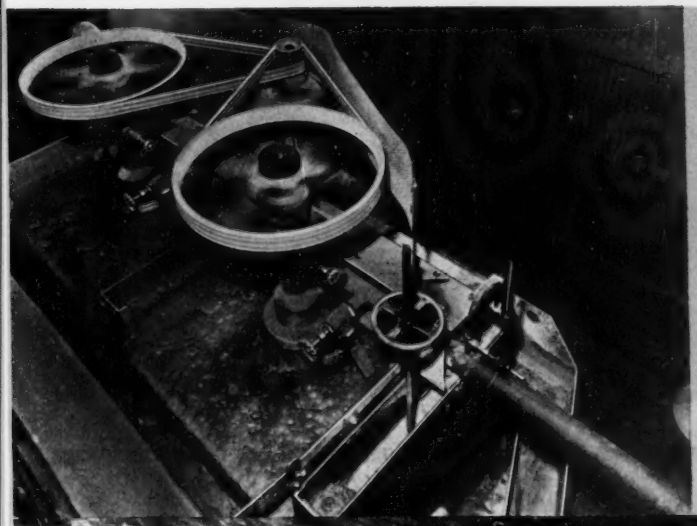


DECO 24 HOUR SERVICE COMPANY

DENVER EQUIPMENT
1402 17th Street, Denver 17, Colorado
Our 25th year of Flotation

may be PROFITS *today!*

Here's the *New* Denver "Sub-A" Super Rougher Flotation Machine to recover more values . . .



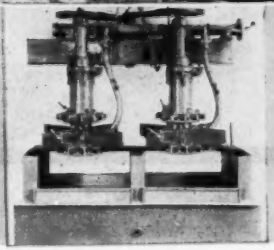
Here is a flexible Flotation Machine that gives intense aeration and short-distance froth overflow, so important on extremely low-grade ores and coarse-grind feed. As a scavenger machine at the tail end of a circuit, the unit increases your mill efficiency by lowering tailings losses.

Featuring a low pulp level, this NEW Denver "Sub-A" Super Rougher Flotation Machine offers controlled aeration, intense agitation, and regulated feed. These are the flexible tools your flotation engineer needs to get results that pay greater profits.

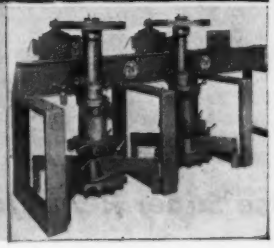
The world's leader in flotation engineering, Denver Equipment Company adds the Denver "Sub-A" Super Rougher Flotation Machine to its long list of continuous flotation machine improvements. You can buy all of your ore dressing equipment from DECO, you get everything from testing to dryer from one company, one responsibility, without a premium.

Find out how you can get more PROFIT out of your ore with a Denver "Sub-A" Super Rougher Flotation Machine. Phone, write or wire today!

For simplified repair, the entire assembly may be removed easily. All wearing parts are standard and interchangeable with other Denver "Sub-A" machines. Single or double impeller mechanisms provide maximum aeration and are furnished to meet your specific recovery and frothing objectives.



Conversion units are built for most makes of flotation tanks. You get the same mechanisms that are standard on the new Denver "Sub-A" Scavenger Machine. This gives you the advantages of standard, reliable DECO service and efficiency. More Denver "Sub-A" Flotation Machines are used for roughing and cleaning than all other makes combined. Find out how you can profit by converting to Denver "Sub-A."

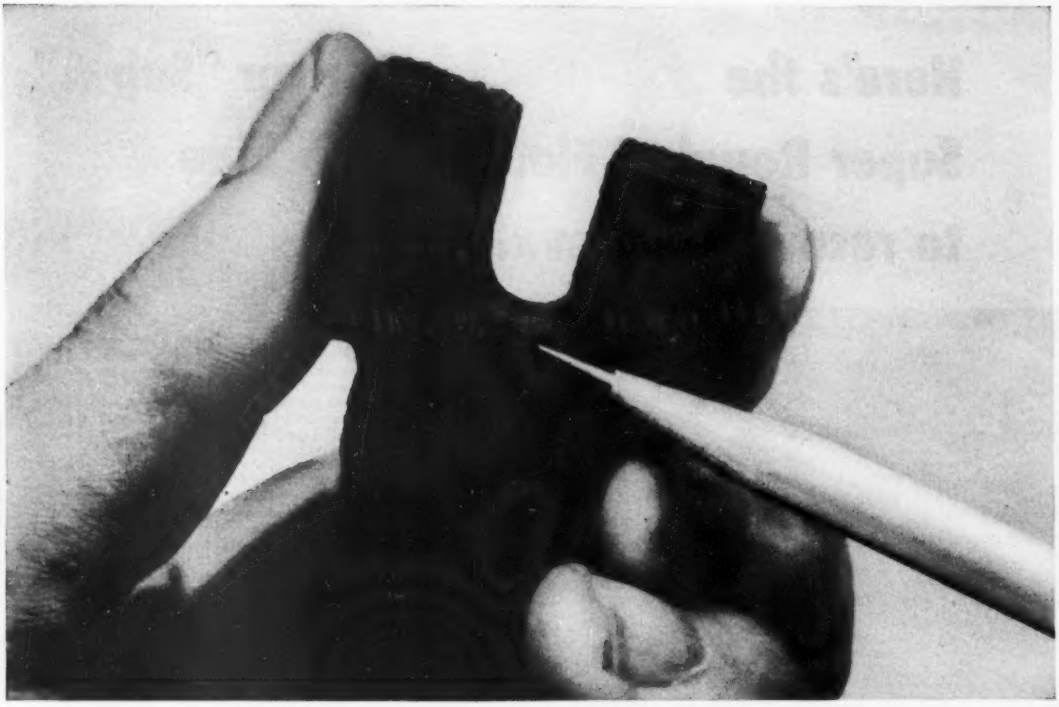


COMPANY

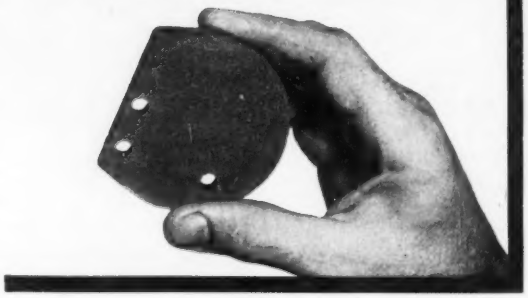
Engineering

On display at the American Mining Congress Denver, Colorado, Sept. 22-25

Though heat is no factor . . . IT TAKES



RAPID HEAT TRANSFER is the prime function of this CARBOFRAX arc shield — i.e. to quickly dissipate the intense heat and quench the arc. Because CARBOFRAX refractories *do* conduct heat so rapidly (as rapidly as chrome-nickel steels at elevated temperatures) they are ideal for heat-exchange equipment of many types. They're used, for example, as radiant tubes, checkers, muffles, recuperator tubes, hearths, etc. It's no problem to make CARBOFRAX refractories in special close-tolerance shapes, including fitted joints, tubes, etc.



Use Super Refractories by

CARBORUNDUM

TRADE MARK

"Carborundum" and "Carbofrax" are registered trademarks which indicate manufacture by The Carborundum Company.

A SILICON CARBIDE REFRACTORY TO STAND THIS ABRASIVE/CORROSIVE ATTACK

The slotted piece pictured opposite is a wire guide. It's used to support newly drawn steel wire as it passes along the bottom of tanks during zinc coating. Very little heat is involved, but, paradoxically, these guides are manufactured of virtually the most refractory material known — CARBOFRAX silicon carbide refractory. It seems to be the *only* material able to stand up under the combined cutting action of the wire and the corrosive action of the plating solution.

Here's why. Made from the same basic material as the well known abrasive products by CARBORUNDUM, CARBOFRAX refractories are very strong physically, and are the hardest, most abrasion-resistant materials commercially available. They will distinctly outwear metals and other normally durable materials — from room temperatures to 3000 F, and more.

They have high chemical stability, and are inherently inert to all acids or acid fumes (except phosphoric and hydrofluoric) — even at temperatures far above those most metals will stand. However, they are no cure-all, and should be applied with caution where molten metallic oxides or molten bases are present. Under these conditions, other Super Refractories by CARBORUNDUM often prove better fitted.

For the full story on CARBOFRAX refractories (and other Super Refractories) — with data on strength, weight, thermal conductivities, etc. — get our booklet. It shows how these interesting materials have been used, where they've proved better than metals, refractories, and other materials. Why not check up? One of these products may have exactly the properties you can use.

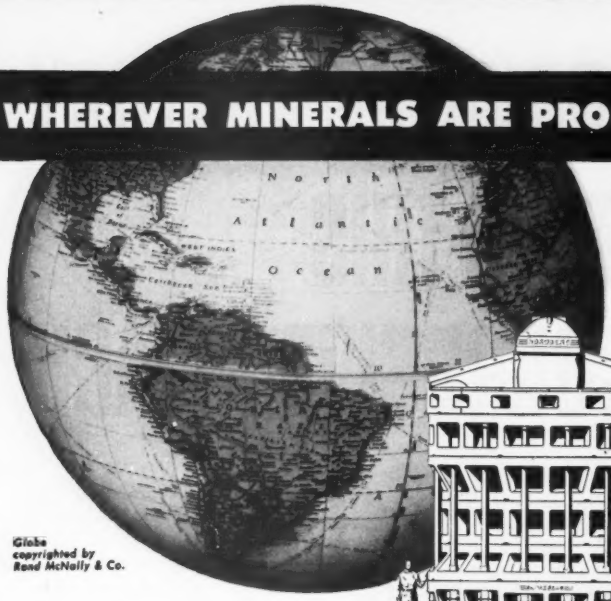
Examples of where CARBOFRAX refractories have licked abrasive and/or corrosive conditions

- In Cyclone Dust Collectors where the blast of millions of highly abrasive particles quickly cuts away other lining materials.
- In SO_2 Converters where the ducts are subjected to the scouring and acid action of high velocity SO_2 and SO_3 gases at 1100 F.
- In Coke Chutes and Hoppers which must withstand punishing cascades of sharp-edged coke — sometimes fiery hot.
- In Muriatic Acid Furnaces, hydrogen cyanide converters, sulphur burners and related equipment attacked by erosion and corrosion.
- In Billet Heating Furnaces where massive metal slabs are dragged over the floor, skid rails, or other bearing surfaces.

Dept. U-92
Refractories Division, The Carborundum Company,
Perth Amboy, N. J.
Send complimentary copy of Super Refractories booklet to:

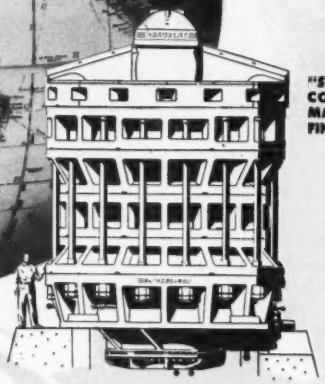
Name_____
Position_____
Company_____
Street_____
City_____ Zone____ State_____

WHEREVER MINERALS ARE PROCESSED...

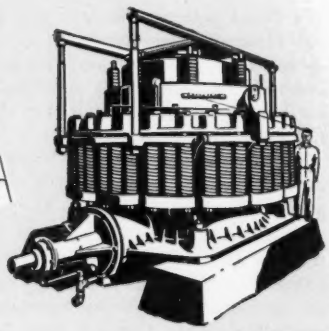


Globe copyrighted by Rand McNally & Co.

for BASE and PRECIOUS METALS ... the RARER ELEMENTS ... METALLIC and NON-METALLIC MINERALS



"SYMONS" GYRATORY and CONE-CRUSHERS for PRIMARY, SECONDARY and FINE REDUCTION CRUSHING



NORDBERG MACHINERY

is the leading choice of producers *THE WORLD OVER...*

• Without the vast mineral processing operations in all parts of the globe, all industrial capacity would be seriously hampered. And without efficient, large-capacity machinery, ore and mineral processing operations would fall far short of their required output.

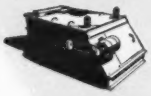
It is highly significant that wherever mineral resources are found in quantity—efficiency minded producers are now using, or are in the process of installing, Nordberg Machinery.

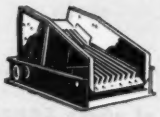
This dependable Nordberg Machinery includes Mine Hoists; *"SYMONS"* Gyratory Crushers for primary breaking; *"SYMONS"* Standard and Short Head Crushers for fine reduction crushing; *"SYMONS"* Vibrating Grizzlies and Screens for scalping and sizing; Grinding Mills for wet or dry grinding and a complete line of heavy duty Nordberg Diesel Engines in sizes from 10 to over 10,000 H.P. in a single unit.

Write for literature on the machinery you need.

NORDBERG MFG. CO., Milwaukee, Wis.

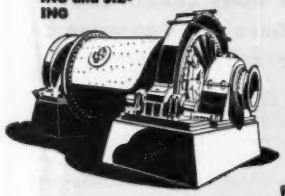
"SYMONS"... A NORDBERG TRADEMARK KNOWN THROUGHOUT THE WORLD



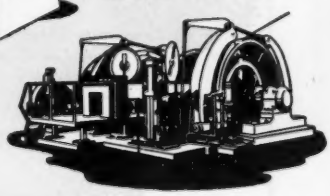


"SYMONS" VIBRATING GRIZZLIES and SCREENS for SCALPING and SIZING

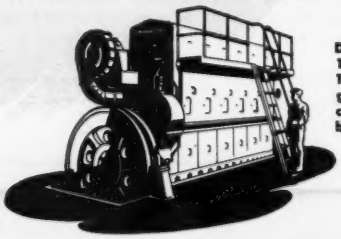
"SYMONS" "V" (VERTICAL) SCREENS for EXTREMELY FINE SEPARATION



BALL, TUBE and ROD MILLS for WET and DRY GRINDING



MINE HOISTS



DIESEL ENGINES, 10 to over 10,000 H.P. Burn gas, oil, or any combination of both.

C752

NORDBERG

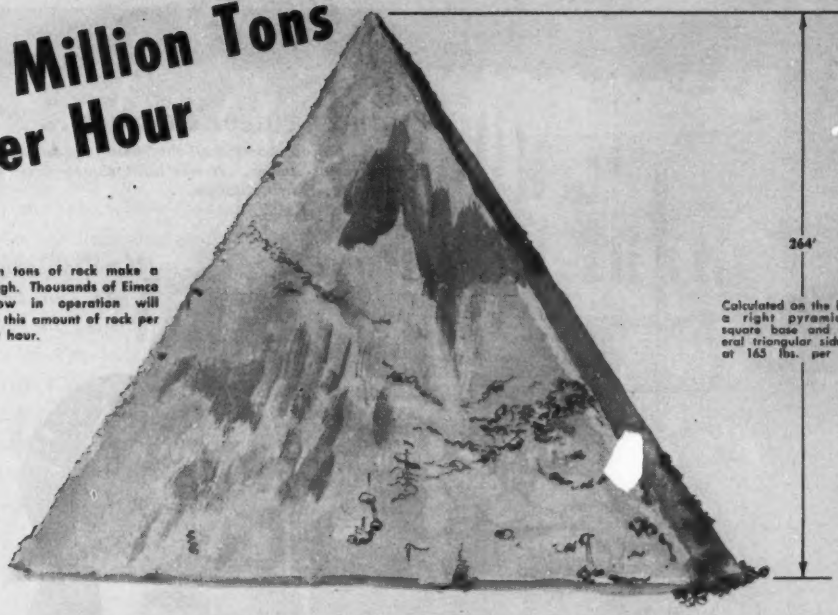
MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

NEW YORK • SAN FRANCISCO • DULUTH • WASHINGTON • TORONTO

MEXICO, D.F. • LONDON • PARIS • JOHANNESBURG

One Million Tons Per Hour

One million tons of rock make a pile 264' high. Thousands of Eimco loaders now in operation will easily load this amount of rock per hour, every hour.



Calculated on the basis of a right pyramid with square base and equilateral triangular sides, rock at 165 lbs. per cu. ft.

MOST TUNNEL DRIVERS USE EIMCOS:

Shown below are pictures of Eimco equipment used in driving five famous tunnels. Eimcos have been used on scores of other tunnels.

MOST HARD ROCK MINERS USE EIMCOS:

Shown below are pictures of Eimco loaders used in several mines Hundreds of others are being used in mining properties throughout the world.

Eimco loaders are preferred equipment wherever rock is loaded underground. The Eimco quality of material and manufacture assures the user of dependability on the job. Greater economies in operating costs and time are available only with Eimco Loaders. Write for information on the Eimco to fit your job.

EIMCO

A393

THE EIMCO CORPORATION

The World's Largest Manufacturers of Underground Rock Loading Machines

EXECUTIVE OFFICES AND FACTORIES — SALT LAKE CITY 10, UTAH, U. S. A.

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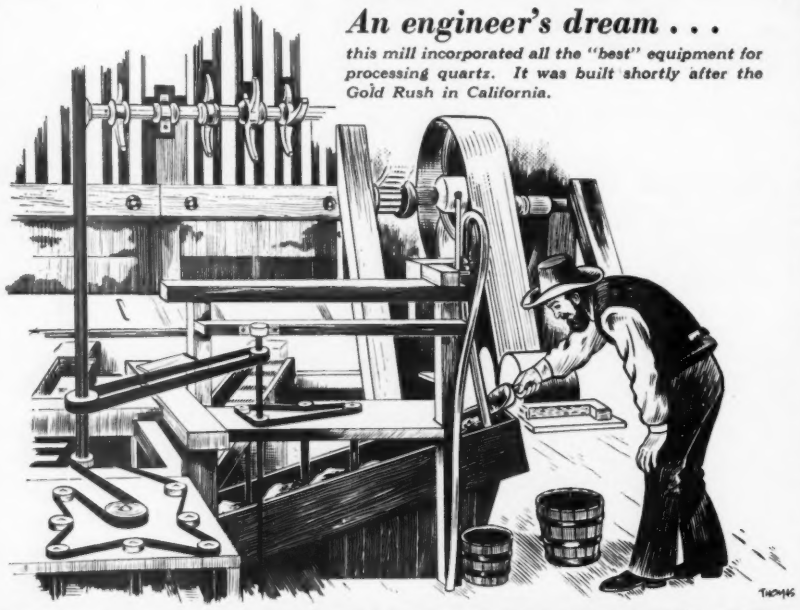
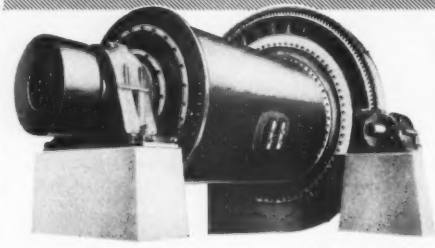
An engineer's dream . . .

this mill incorporated all the "best" equipment for processing quartz. It was built shortly after the Gold Rush in California.





As great mining developments opened up in our country, the mining industry repeatedly devised more efficient methods to increase production. These improvements in technique came hand-in-hand with the invention of better equipment. For 50 years, Traylor has led in designing advanced crushing machinery to meet the growing demands of the industry. Mining men know that experience is their most dependable guide for matching machines with methods for best results. Traylor has experience . . . half a century of it.

Traylor builds Ball, Rod, Tube and Compartment Mills. Each type is produced in a wide variety of sizes to meet your exact needs.

OUR GOLDEN ANNIVERSARY YEAR 1902 1952

TRAYLOR ENGINEERING & MANUFACTURING CO.
1422 MILL ST., ALLENTOWN, PA.
Sales offices: New York · Chicago · San Francisco
Canadian Mfrs.: Canadian Vickers, Ltd., Montreal, P.Q.

a **Traylor** *leads to greater profits*

BRAWN for tire-bruising jobs

NAME the jobs where stone bruises, cuts and snags are damaging your tires — and you've named the jobs for this rugged giant. For this is the Hard Rock Lug — the super-tough Goodyear with sidewalls armored by massive lug bars, with an extra-thick undertread protecting its extra-thick body, with a self-cleaning tread that means better traction forward or reverse. No wonder the Hard Rock Lug is top favorite with cost-wise operators for mining and pit and quarry work, and for all the toughest, roughest, tire-killing hauls!

HARD ROCK LUG
Super-tough champ in all types of tire-killing work.

HARD ROCK RIB
Companion tire for front wheels in all tire-killing service. Easier steering, smooth rolling, same cord body, same shoulder and sidewall as the Hard Rock Lug.

ROAD LUG
The high-stamina, dual-purpose tire that's best for trucks operating both OFF and ON the road. Tough construction and special tread design provide super traction off the road—long, smooth mileage on the road.

THERE'S A COST-CUTTING GOODYEAR TIRE FOR EVERY JOB

Road Lug—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TIRES THAN ON ANY OTHER KIND

Here's why more than 32,000 mine cars have been built with U·S·S COR-TEN steel

● U·S·S Cor-Ten is a ductile, low-carbon chromium-nickel-silicon-copper-phosphorus steel having a minimum yield point, in thickness of ½" and under, of 50,000 psi—at least one and one-half times that of structural carbon steel.

It has a minimum tensile strength of 70,000 psi in these same thicknesses. Its resistance to abrasion and shock is superior to structural carbon steel; its fatigue resistance—that is, its ability to withstand vibration stresses—is 60% greater.

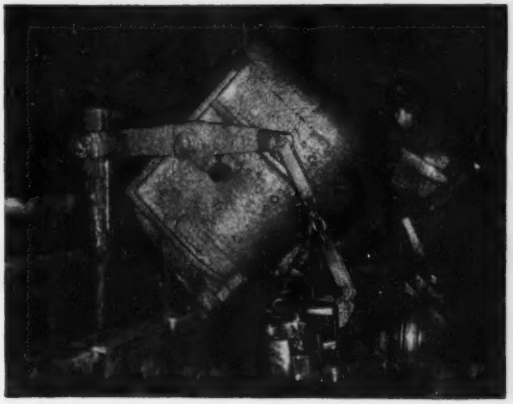
What particularly distinguishes U·S·S Cor-Ten steel is its very high resistance to atmospheric corrosion—4 to 6 times that of plain steel, 2 or 3 times that of copper steel. This property helps to assure the safety, long life and low maintenance cost of any equipment in which Cor-Ten steel is used, whether to obtain greater durability, or in lighter thicknesses to reduce weight.

U·S·S Cor-Ten High Strength steel is produced in all standard products—plates, shapes, bars, sheets, strip, special cold formed sections, wire and tubular products. It is recommended particularly in light and intermediate thicknesses.

★

Twenty-two 74-cu. ft. mine cars put into service eleven years ago. ¼" COR-TEN steel used in body and floor plates. Each car has handled over 85,000 tons of highly abrasive ore.

★



...that U·S·S Cor-Ten HIGH STRENGTH Steel

will give your equipment the stamina to stay on the job!

BUILT in 1941 by the C. S. Card Iron Works Company for a western copper mine, 22 mine cars were designed to be used with a 12-inch grizzly.

Instead, for eleven years, they have been loaded from a 24-inch grizzly, handling chunks of very abrasive ore up to 2' x 4' in size—twice as big and twice as heavy as they were designed for.

Despite this, and after operating day-in and day-out under highly corrosive conditions, the cars are still on the job and ready for more service, although each car has already handled more than 85,000 tons of ore.

This case is typical. It illustrates the added ruggedness and durability that you can confidently expect when your equipment is built with U·S·S COR-TEN steel.

With this tougher, stronger steel that offers high resistance to atmospheric corrosion, to wear, impact, shock and fatigue, you can materially increase the stamina of parts without increasing their weight. With U·S·S COR-TEN steel, not only mine cars, but buckets, skips and cages, shovels, trucks, scrapers, dozers, carryalls, etc., can be built to last longer and to do more work.

For 17 years our engineers have cooperated with the mining industry in applying U·S·S COR-TEN steel to equipment noted for its dependability, long life and low maintenance cost. We will be glad to show you how this superior high strength steel can be most economically applied to make your equipment more efficient.

UNITED STATES STEEL COMPANY, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S COR-TEN High Strength STEEL

USS

D-1487

UNITED STATES STEEL

Here's the Big Difference!

TAPER-LOCK

-The Sheave that always runs true!

The Taper-Lock bushing seats evenly along the entire length of the hub. It is self-seating. There is no collar—no protruding part—no flange to prevent uniform compression.

With full contact, Taper-Lock sheaves run true. Made of finest grade of close-grained semi-steel, cast in the Dodge foundry. Precision grooves have identical pitch diameters so that every belt can pull its share of the load.

Sheave and bushing mount as a unit—easy to align on the shaft. Grips the shaft like a shrunk-on fit. Flush hub means safety.

THERE IS ONLY ONE TAPER-LOCK (a patented product of Dodge). Available from distributors' stocks in a complete range of sizes in A-B combination, B, C and D grooves. Also ask your distributors for Dodge Sealed-Life V-Belts. WRITE for complete data.

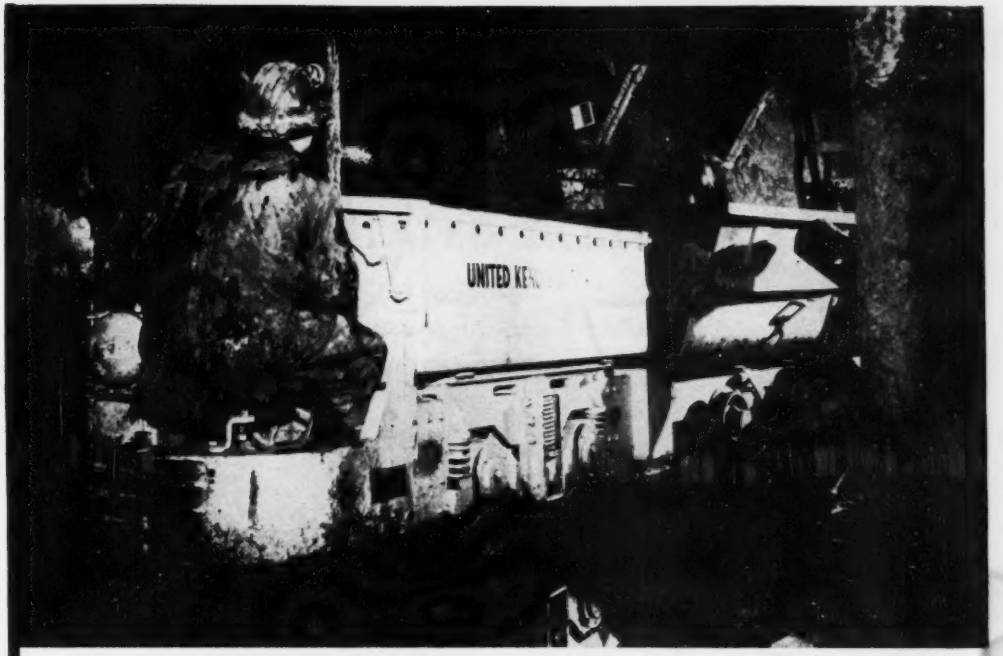
DODGE MANUFACTURING CORPORATION, 3100 Union St., Mishawaka, Indiana

DODGE

of Mishawaka, Ind.

CALL THE TRANSMISSIONEER

your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Machinery" in your classified phone book.



MANCHA STORAGE BATTERY LOCOMOTIVES

MORE HAULAGE POWER "UPS" PROFITS. Mancha chassis design is based on the principle: "strength without excess weight." This permits the use of a big battery, which provides part of the total necessary operating weight of the locomotive. And the extra battery capacity made available can be used *productively*—to move pay loads—not partly dissipated moving an unnecessarily heavy locomotive chassis.

MORE SERVICE — LESS SERVICING — *KEEPS* PROFITS UP. Mancha Storage Battery Locomotives deliver continuous service under difficult operating conditions. Less maintenance, fast, easy battery changes with Mancha's battery transfer rack result in less time out of service. It all adds up to real haulage efficiency and over-the-years economy.

AT THE SEPTEMBER METAL MINING SHOW IN DENVER . . .

Mancha Locomotives will be displayed at the Goodman exhibit. You are cordially invited to stop in for a visit and see the latest additions to our line of locomotives.

WILL A MANCHA PAY IN *YOUR* MINE?

Whether or not you intend to buy today, send for our mine haulage Data-Form. Mail the coupon and get the answer *now* — without obligation.

Mancha Storage Battery Locomotive
Division GOODMAN Manufacturing Company
4850 South Halsted Street, Chicago 9, Ill., U.S.A.
(2nd-J-oss)
Send your mine haulage Data-Form

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FIRM.....

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CITY.....ZONE.....STATE.....

MANCHA STORAGE BATTERY LOCOMOTIVE
Division **GOODMAN** *Manufacturing Company*
4850 SOUTH HALSTED STREET CHICAGO 9, ILL., U. S. A.

How concave sides cut V-Belt costs

Important to anyone who wants to cut V-Belt replacement costs is the simple, interesting reason WHY Gates Vulco Ropes are built with *Concave Sides* (U. S. Patent 1813698). See Figure 1.

When a Gates belt is bent around a sheave these Concave Sides fill out to full, even contact with the sides of the sheave groove. (Figure 1A). This gives you sure pulling power. And, naturally, because wear is distributed evenly, the Concave Sides actually give you longer wear—longer belt life. That cuts V-Belt replacement costs.

On the other hand, when a straight sided V-Belt (Figure 2) is bent, the sides bulge out, preventing the belt from fitting evenly in the sheave groove. This causes *extra wear* at the points shown by arrows. (Figure 2A).

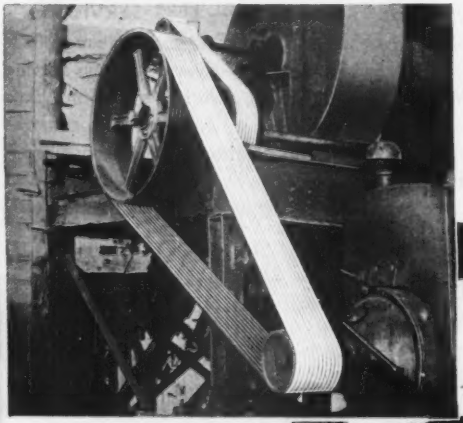
Make this simple test yourself...

Hold a straight sided V-Belt as it would be bent around a sheave. Take the sides of the belt between your finger and thumb. You can *feel* the bulges in the sides—the bulges that prevent an even fit in the sheave groove and cause extra wear.

Now do the same thing with a Gates Vulco Rope. You can feel the sides fill out. You can see why they press firmly and evenly against the sides of the sheave groove—giving you longer belt life—lower belt costs.

When you buy V-Belts be sure to get Gates Vulco Ropes—the V-Belts with the Concave Sides.

Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and in 71 foreign countries.



SAVING $600 ANNUALLY

When these sand drying drums were flat belt driven, heat and dust reduced belt life to as little as two weeks.

The Gates Vulco Rope drives that replaced them are saving the Zigler-Cline Construction Co., Fayetteville, North Carolina, more than $600 annually.

CS-526-B

Gates® VULCO ROPE DRIVES

THE GATES RUBBER COMPANY • DENVER, U.S.A.

V-Belts—Hose
Molded Rubber Goods
for industry
World's Largest Maker of V-Belts

On the *TOUGH* Jobs Operators know

JALLOY HEAT-TREATED PLATES

J&L STEEL

. . . resist impact, abrasion and corrosion

. . . provide longer service life, lower maintenance costs

Cost-conscious mine operators throughout the industry are cutting maintenance and downtime costs by installing tough J&L Jalloy heat-treated steel plates on their equipment.

They've found that on the tough applications heat-treated Jalloy lasts 4 to 20 times longer than mild steel. The reason—Jalloy has the physical properties to resist the severe impact, abrasion and corrosion of mining operations. It is produced with a yield strength of 160,000 lbs. per sq. in. and a Brinell hardness of 341 to 388. The result—Jalloy saves money by cutting steel requirements, reducing downtime for repairs and replacement, and keeping labor costs for maintenance to a minimum.

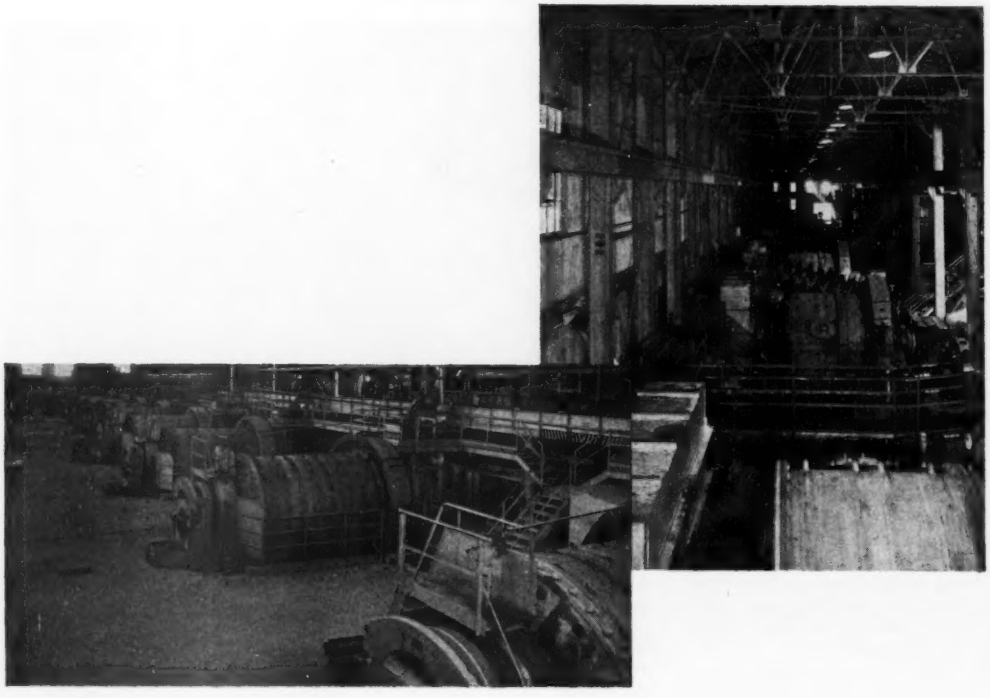
Here are some of the applications where mine operators are using heat-treated Jalloy—Dump Truck Bottom Liners, Coal, Rock and Ore Chute Liners, Dipper Stick, Shovel and Drag Bucket Reinforcing. You can get Jalloy in bar form and in plates up to 72" wide and 20' long with thicknesses from 3/16" to 1½".

Start finding out more about Jalloy today. Just write to Jones & Laughlin Steel Corporation, 412 Jones & Laughlin Building, Pittsburgh 30, Pa. We'll send you a free copy of our booklet, "For Longer Wear . . . Less Repair!" It will give you more complete information on the properties, heat treating and workability of heat-treated Jalloy, the modern mining and quarrying steel.

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH 30, PA.

A Cost-cutting • MARCY MILLS



OTHER M&S AND CIW PRODUCTS

MASSCO GRIGSBY RUBBER PINCH VALVES
DENSITY CONTROLLERS

WILFLEY TABLES

LABORATORY CRUSHERS AND PULVERIZERS
SKINNER ROASTERS

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team

• AKINS CLASSIFIERS

The many successful mining companies thruout the world who continue to place repeat orders for Marcy Ball and Rod Mills and Akins Classifiers prove the low-cost-per-ton performance of these machines.

The Mine & Smelter Supply Co.

Let our engineers show you the proof... actual operating data for all kinds of grinding and classification problems.

Denver 17, Colorado

OFFICES IN SALT LAKE CITY, EL PASO, 1775 BROADWAY, N. Y. C.

AND ITS SUBSIDIARY COMPANY **COLORADO IRON WORKS**

Denver 2, Colorado

WE MAPPED 500,000 ACRES TODAY...
HOW'S YOUR EXPLORATION COMING ALONG?

Speedy Air Surveys deliver Photos and Maps at a Fraction of the Cost of Ground Surveys

Before expensive ground studies begin, you can get a lot of reconnaissance facts from the air. Facts about surface geology and general trends, from detailed stereo-photos of your area. These same photos, carefully assembled in photo-mosaics, provide base maps for surface work.

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In addition to air photo coverage, AERO has helped to uncover major new finds of magnetite, ilmenite, asbestos and other minerals. Our surveys provide direct, significant data.

How much will air surveys cost? Generally, very much less than ground surveys. The larger the area, the greater the saving.

Call on our million miles of world-wide exploration experience when you plan your next survey. Write us for a budget figure.

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TOPOGRAPHIC MAPS • PLANIMETRIC MAPS
PRECISE AERIAL MOSAICS
AIRBORNE MAGNETOMETER SURVEYS
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In Canada our affiliate is CANADIAN AERO SERVICE, LTD., *Ottawa*

See how to save money on your mapping and exploration — visit Booth 1419 at Denver.

A new development for moving hot and abrasive materials...

It's worth investigating

For the past 20 years the inherent strength, capacity and power of the GOODMAN SHAKER CONVEYOR has ideally suited it for moving coal, ore, rock and slate in underground mines. Now a troughing has been developed to handle hot and abrasive materials in industrial plants.

HANDLES THE ROUGH JOBS

Transports wet or dry materials: coke, sinter, dolomite, steel scrap, mill scale, castings, silicon carbide, bauxite, and other ores.

VERSATILE

Adaptable to short or long distances, small or large tonnages—upgrade, downgrade, or on the level. Powered by electric or air drive.

ENGINEERED TO YOUR CONDITIONS

This special Goodman service assures you of a trough line and drive unit exactly right for your job—a conveyor system that will give you high continuity of operation, low maintenance cost.

You are cordially invited to visit the Goodman exhibit at the September Metal Mining Show in Denver. Included in our material transporting equipment display will be an industrial shaker conveyor set-up, with experienced engineers on hand to talk over its application.

80044 Shaker conveyor transporting hot castings and mold sand to shakeout.

Goodman MANUFACTURING COMPANY

Halsted Street at 48th • Chicago 9, Illinois

A complete line of electric locomotives and belt conveyors for metal mine service.

Here's Why rubber-will make

LETOURNEAU EQUIPMENT

WHY CRAWL WHEN YOU CAN RUN?

tired TOURNADOZER more money for YOU

① this job-proved dozer on rubber "runs" at 19 m.p.h.
Instead of "crawling" at 4 to 8 m.p.h., Tournadozer has top speed of 19 m.p.h. — maneuvers twice as fast — dozes twice as fast as the average crawler. It gives you reverse speeds up to 8 m.p.h. . . . cuts deadhead cycle time of most crawlers by 2.5 to 1. And, you get more use from these greater working speeds, because you have instant speed selection and can change into higher gears any time without shifting or stopping.

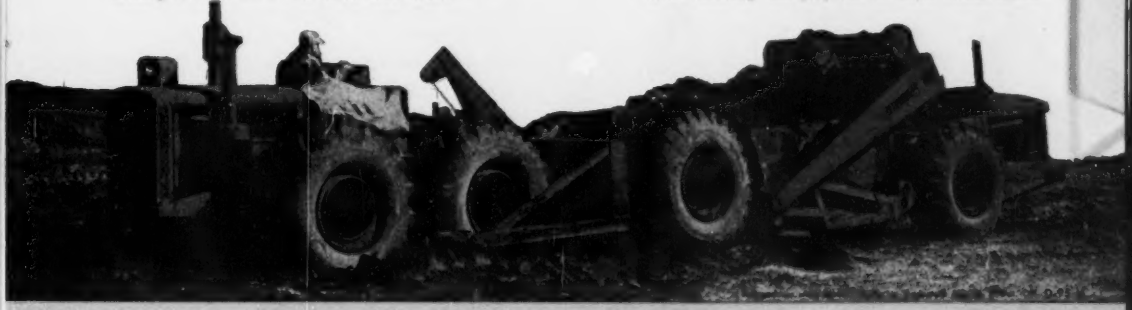
② big tires give less slowdown for soft, slippery going
Giant 21.00 x 25 low-pressure tires give you increased traction and flotation in all types of soil. 186 h.p. push on 4-wheel drive moves heavier loads. Instant speed change eliminates stops for shifting . . . keeps vital momentum . . . takes you through soft spots. Extra equipment includes down-pressure blade attachment for cutting through hard materials and more accurate grading . . . also torque converter for smoother, more effective application of power.

③ high-speed mobility puts waiting periods to work
All controls are easy to reach, easy to handle. Operator sits up front, ahead of diesel engine . . . can see where he's going . . . what he's doing. No stretching, no twisting, no end-of-day fatigue slowdown. Driving one of these high-speed Tournadozers is easier than driving a truck . . . and much less work.

④ drives via highway on job-to-job moves
Tournadozer drives cross-country, along tracks, over highways at speeds up to 19 m.p.h. No blocking, no waiting for trailer, no loading or unloading delays. Big tires prevent damage to pavement, curbing, tracks, etc. Multi-disc 4-wheel air brakes (2822 sq. in., total braking surface) and fingertip electric steering control give operator confidence to use top speeds while traveling or when dozing over edge of bank.

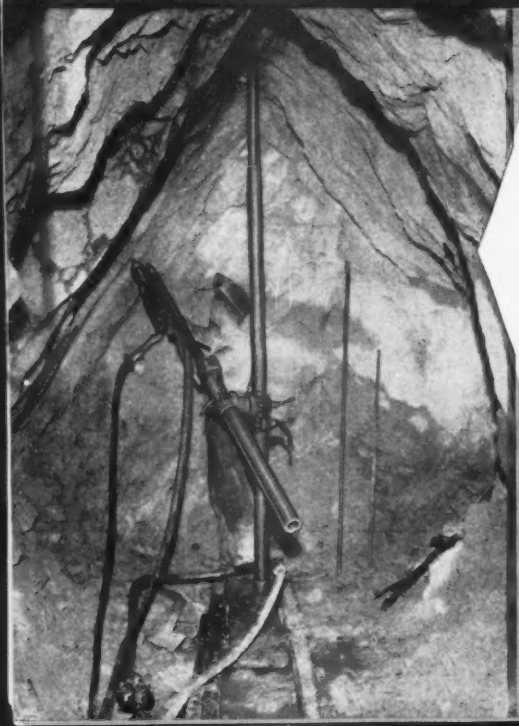
⑤ easy to operate . . . easy on the operator
When needed on scattered odd jobs, operator just hops on this big dozer . . . and drives down paved right-of-way or across the pit to his next assignment. One Tournadozer frequently handles clean-up for 3 or more shovels . . . often maintains widely-scattered dump areas, as well. Pushers often do road maintenance during normal waiting periods.

⑥ works and earns during the off-season
Winter or summer, it's easy to keep Tournadozer working and earning. Coal stockpiling, snow plowing, railroad switching are particularly good tasks for the "C". Just use standard Bulldozer blade or any of 9 auxiliary tools — including V-type Snow Plow, Angledozer, Side-Boom Crane, Logging Winch, Rooter or Scraper. With each unit, Tournadozer's high speeds and rubber-tired mobility will pay off in more work done.



R. G. LeTOURNEAU, INC.
Peoria, Illinois

New!



Miners like Le Roi-CLEVELAND HC23RW Reverse Air Feed Drifters

Management does, too

Faster Steel Changes! No swing or dump nuts to loosen and reset. Your miners simply swing drifter on feed cylinder and change steels. It's not only easy — it lets them drill out the round faster.

No Stuck Steels! Positive air feed keeps drills working at peak efficiency, avoids stuck steels.

Higher Drilling Speeds! Positive air feed plus proper force of blow and strong rotation give faster drilling speeds with both steel and tungsten carbide bits. You get longer bit life, too, and drill more footage.

Low Upkeep Cost! No feed screws or feed-screw nuts to wear. No complicated power-feed mechanism to give trouble.

Easy to Operate! Built to lighten the load on your miners. Feed controls conveniently located. Reverse air feed withdraws steel from hole quickly.

Faster Set-ups! The combination of Le Roi-CLEVELAND Air Feed Drifters and air columns gives you a unit that can be set up easily and quickly. And you can get the air column in any height you want.

drilling cycles

Le Roi-CLEVELAND *self-leveling* Mine Jumbo with four-foot steel-change Air Feed Drifter

Saves time drilling lifters! Lets your miners drill the right round for any ground!

You couldn't ask for more from a mine jumbo than the performance you get from this new Le Roi-CLEVELAND. It's got plenty of stuff. And the payoff for you is faster cycles, greater tonnage per man-shift, lower costs! Here's why:

Self-leveling, air-motor-powered arm, lets miners spot and space holes quickly and easily, for the most efficient fragmentation. They don't have to loosen a bolt or tilt a boom, to complete the drilling cycle.

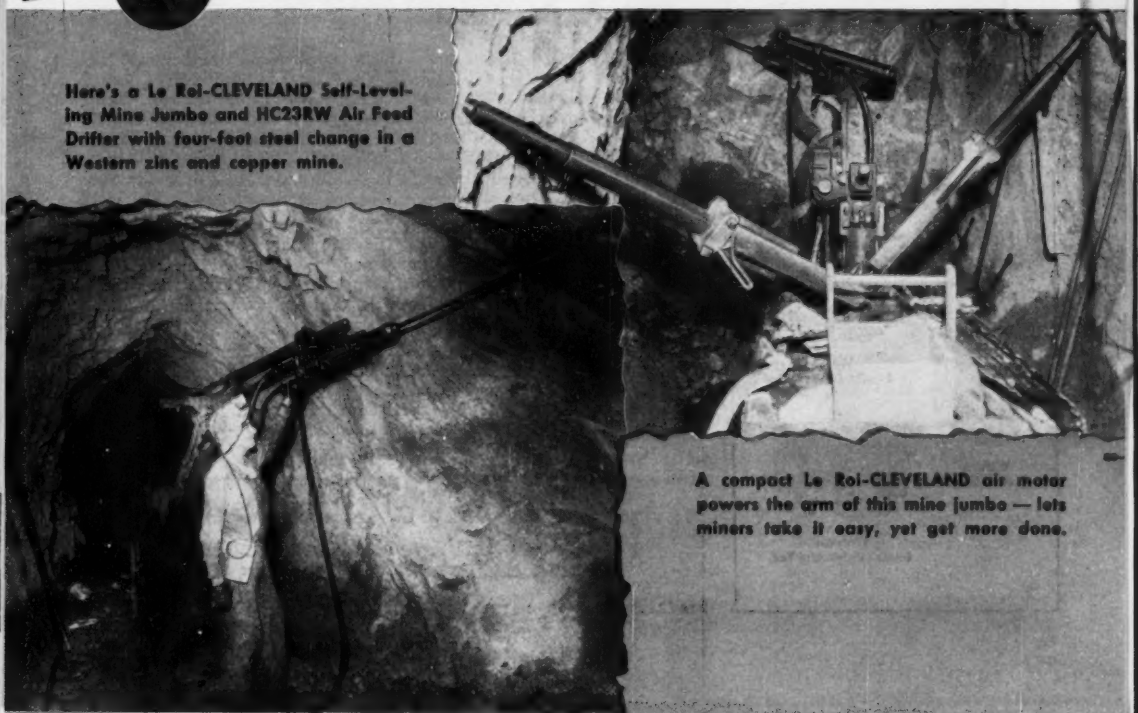
Exclusive rigid screw and gearing mechanism keeps the heading straight, cuts down overbreak and underbreak. Keeps the drifters in line, prevents the steel from binding, reduces chuck wear.

Offset arm provides plenty of clearance to drill lifters — without having to take time out to swing the drill under the arm.

You can get this Le Roi-CLEVELAND Self-Leveling Mine Jumbo in either single-arm or double-arm construction. Write for further information and see for yourself how either model can help you get more done every shift.

LE ROI COMPANY

CLEVELAND ROCK DRILL DIVISION
12500 Berea Road, Cleveland 11, Ohio
Plants: Milwaukee, Cleveland and Greenwich, O.



Here's a Le Roi-CLEVELAND Self-Leveling Mine Jumbo and HC23RW Air Feed Drifter with four-foot steel change in a Western zinc and copper mine.

A compact Le Roi-CLEVELAND air motor powers the arm of this mine jumbo — lets miners take it easy, yet get more done.

Pressure-Seal Cast Steel Gate Valve

Small Cast Steel Angle and Y-Globe Valves for high-pressure service

Walseal Bronze Strainer

Walseal Bronze Globe Valve

Walseal Bronze Elbow

Walseal Bronze Union End Tee

Walworth is proud to be aboard the S. S. United States

When the United States Lines, the Newport News Shipbuilding & Dry Dock Company, and Gibbs & Cox, Inc., naval architects, join forces to build the fastest, safest and most modern liner the world has ever seen, the selected materials and components have to be top quality. Walworth Pressure-Seal Cast Steel Gate, Globe, and Angle Valves, and Walworth Small Cast Steel Angle and Y-Globe Valves for high-pressure service are installed in the main steam lines of the S. S. United States. Brass and copper lines use large numbers of Walseal valves, fittings, strainers, and unions.

Knowing that Walworth valves and fittings are a vital part of the power arteries aboard this great ship, the proudest moment of Walworth's 110 years of manufacturing experience came when the new Queen of the Sea broke both the east and west trans-Atlantic speed records.

As we present our compliments to Commodore Manning and his crew, to the Newport News Shipbuilding & Dry Dock Company and its men, and to William F. Gibbs and his staff, we also compliment the men and women of the Walworth Company who gave of themselves to put quality into our products and this quality ship.

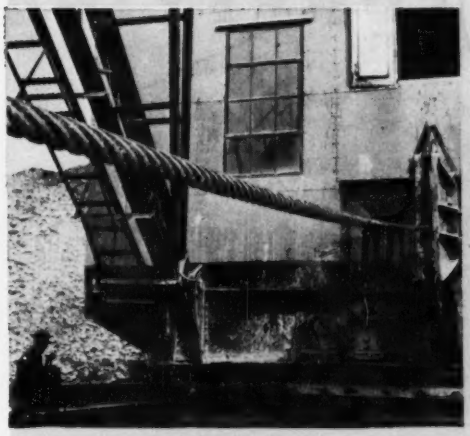
WALWORTH

valves • fittings • pipe wrenches

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

The Proper Rope *plus* Proper Maintenance



This new Tiger Brand Drag Line Rope was designed especially to resist the extremely severe operating conditions encountered in this class of service. On one job where ropes lasted an average of 600 hours, this Tiger Brand Drag Line Rope was still going strong after 1100 hours—believe it or not!

Equals Longer Rope Life Lower Rope Costs

● Many prominent users of wire rope have found they can reduce wire rope costs as much as 50% by using a wire rope designed for the job. They get better rope service at lower rope cost by following this simple, job-tested system, with the help of the Tiger Brand Wire Rope Specialist.

Let this qualified expert make *sure* that you select, for each job, a wire rope that is strong enough to carry the load with an ample margin of safety . . . able to stand incessant flexing and sharp bending without failure of wires due to fatigue . . . built to take the most severe abrasion and crushing. Then make sure that every foot of wire rope you own is inspected, cleaned and lubricated *regularly*.

Engineers and contractors who follow this procedure tell us that they are getting twice — sometimes three times—the life they expected from Tiger Brand Wire Rope, plus greater safety for crews and equipment and freedom from rope-caused work stoppages, all of which means important money savings.

When you are in the market for wire rope, make full use of the engineering knowledge of an expert who has made a life-work of analyzing and solving wire rope problems. Just drop us a line and your Tiger Brand Wire Rope Specialist will be glad to consult with you. Meanwhile, why not send in the convenient coupon for a copy of our latest book?

More than a million tons of oyster shells have been converted into chemicals at this plant. The owners have found that Tiger Brand Wire Rope stands up best under these severe abrasive conditions, cutting rope costs, reducing down time and keeping equipment at top capacity.

SEND FOR THIS NEW BOOK. It contains specification data that will help you select the right rope for each application. In descriptive text, illustrations, diagrams and tables, it gives you complete information on types of rope, diameters, working loads and safety factors for all sorts of rope service.

American Steel & Wire
Rockefeller Building, Dept. C-9
Cleveland 13, Ohio

Please send me your new book, "Specification Data, Tiger Brand Wire Rope."

Name.....

Company.....

Address.....

City.....Zone....State.....

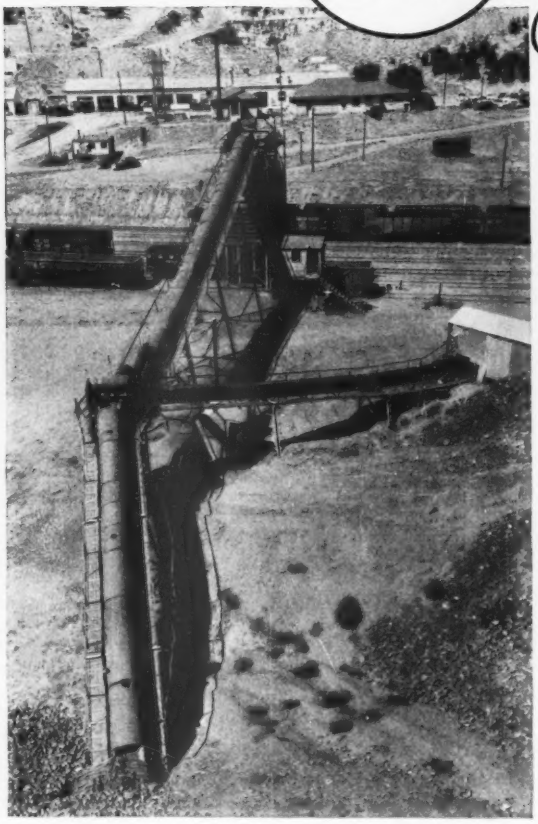
AMERICAN STEEL & WIRE DIVISION
UNITED STATES STEEL COMPANY, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S AMERICAN TIGER BRAND WIRE ROPE

Excellay Preformed

UNITED STATES STEEL

S-A CONVEYING Systems



In this ore reclaiming system S-A belt conveyors collect different kinds of iron ore from two separate storage piles. Belt conveyors running in tunnels under each pile bring ore to a surface junction point from which it travels on another belt conveyor up to a screen located over the shipping bins. Ore is stored and shipped out as required.

iron out Iron Ore

HANDLING PROBLEMS

In this western iron mine, S-A engineers worked hand-in-hand with the ore plant's own engineering staff to perfect and install a fast, efficient, reliable ore reclaiming system. S-A was selected for this job because of its long-established know-how, its wealth of practical, on-the-firing-line experience and its complete line of bulk materials handling equipment units. Perhaps you too will benefit by consulting with S-A engineers. Your letterhead will bring full information.

Belt Conveyors
Belt, Pan & Plate Feeders
Ship Loading Boom Conveyors
Stacking Conveyors
Storage & Reclaiming Systems
"Natural Frequency" Vibrating Conveyors
REDLER Conveyor-Elevators
ZIPPER Conveyor-Elevators
Conveyor Belt Cleaners
Headshaft Holdbacks
Grizzlies & Screens
Centrifugal Pilers
Bin Gates & Tunnel Gates
Car Pullers & Spotters
Bucket Elevators
Skip Hoists
SEALMASTER Ball Bearing Units

• *Write for a bulletin on any of the above.*

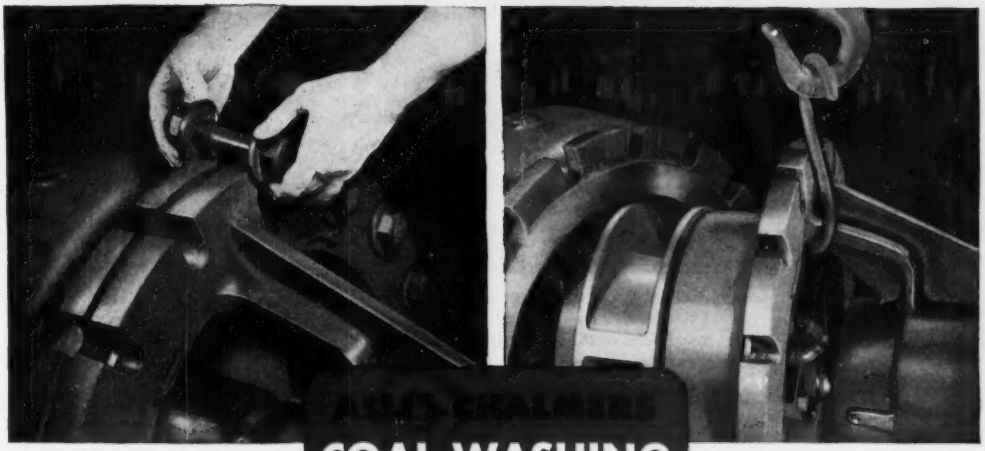
STEPHEN S-A ADAMSON MFG. CO.

4 Ridgeway Avenue, Aurora, Illinois — Los Angeles, Calif., Belleville, Ontario

DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT

QUICK, EASY DISASSEMBLY MEANS

Low Service Cost



1. Disconnect drive, loosen casing bolts and lift bolt assembly from slot. Bolt, nut and washers are still connected for easy reassembly.

COAL WASHING PUMP

2. Swing out rotating element. Neither suction nor discharge piping is disturbed. All wearing parts are fully accessible for inspection or servicing.

Back in Service in less than a Half Hour

ALLIS-CHALMERS

Coal Washing Pump

Only 5 Wearing Parts

Shaft sleeve, impeller, casing, two wear plates. All easy to handle and easy to replace.

YOU CAN SEE for yourself how quick and easy it is to service an Allis-Chalmers Solids Handling Pump. Fast servicing like this plus long runs between servicing keeps your pumping costs low.

You get long life from Allis-Chalmers Coal Washing Pumps, too, because they are made of special hard *Allisite* alloy . . . because they have thick sections and heavy parts throughout . . . and because they are application engineered by specialists who know coal washing problems and how to solve them. Allis-Chalmers can supply the complete pumping unit — pump, motor, drive and control — of matched components from one reliable source with one guarantee of satisfaction.

Get complete information on Allis-Chalmers Solids Handling Pumps from your nearest Allis-Chalmers Authorized Distributor or District Office. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, asking for Bulletin 08B6381. A-3781

Allisite is an Allis-Chalmers trademark.

ALLIS-CHALMERS AC

PROGRESS IN THE MAKING
Missouri lead mine—about 1890. The "new-fangled" steam hoist in the background was beginning to supplant the muscle-operated hoist in the foreground.

An enlargement of this photo suitable for framing is yours for the asking.

Times Have Changed...

Blasting practices of yesterday have gone the way of the hand hoist!

Once, mining mostly was a matter of "muscling" rock. Holes were drilled with hand steel. Blasted rock was hoisted to the surface with hand windlasses. Then, progress brought machine drills and fast power-hoists—and important improvements in blasting techniques.

The latest major improvement in underground blasting practices is the use of milli-second delay detonators—pioneered by Atlas in the ROCKMASTER Blasting System. Now the miner really can control the time of the application of explosives energy to blast out more ore at lower cost.

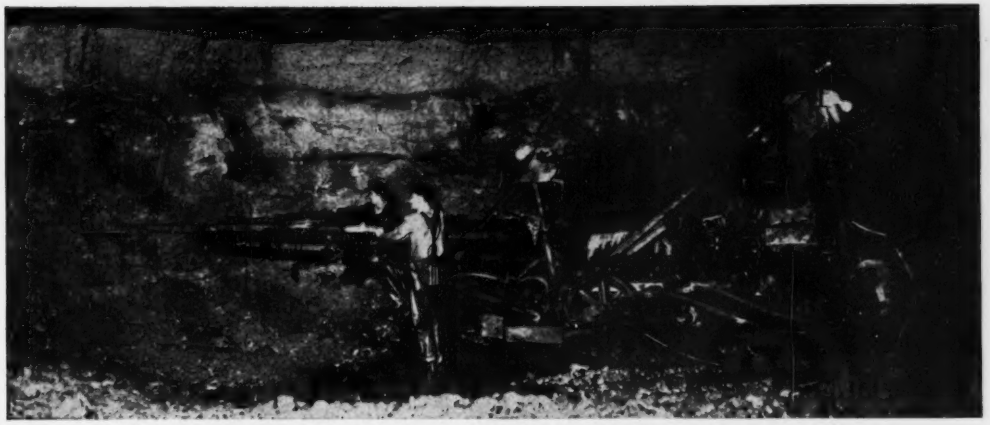
ROCKMASTER blasting offers control over breakage, throw, noise, and vibration. And improvements in this blasting *system* constantly are being made. With proper drill patterns and loadings, miners are getting results far beyond past expectations.

Find out how you can bring your blasting methods up-to-the-minute. Send for the free 26-page booklet on ROCKMASTER blasting.

ATLAS EXPLOSIVES
"Everything for Blasting"

CHEMICALS ATLAS EXPLOSIVES

ATLAS POWDER COMPANY, Wilmington 99, Del. • *Offices in principal cities* • *Cable Address—Atpowco*



This two-drill jumbo, mounted on a crawler chassis, collars and bottoms breast holes with one 10-ft rod of hollow drill steel. Drifters are mounted on 11-ft sashes incorporating an air-powered chain feed.

Crawler jumbos speed drilling at Eagle-Picher

This mobile unit is typical of Eagle-Picher ingenuity. The giraffe-like jumbo has a 35-ft telescoping mast for taking down roof. Another model has a 65-ft mast. Holes are started with a 12-ft steel and finished with a 20-ft length.

Photos courtesy of S. S. Clarke, General Superintendent of Mines, Eagle-Picher Mining & Smelting Co., Cardin, Okla.

Traditionally a leader in the development of new mining methods, Eagle-Picher Mining & Smelting Company is one of about thirty mine-mill operators in the famed Tri-State zinc-lead district. The massive, flat-lying ore bodies of this region have contributed heavily to the nation's stockpile of metals in two world wars.

Eagle-Picher, now operating 19 mines, has made a number of outstanding contributions to drilling technique. An example is the crawler-propelled jumbo, mounting two or three drifters, which cuts down drill set-up time and operator fatigue. The 11-ft sashes make it possible to collar and bottom breast holes using only one 10-ft rod of hollow drill steel. Two lengths of steel are used for stoping a hole 14 to 16 ft in depth. Safe and easy to operate, these jumbos have greatly reduced drilling costs and increased tonnage.

Like so many leading mines, Eagle-Picher uses large quantities of Bethlehem Hollow Drill Steel, both our standard carbon and alloy grades, in their operations.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM HOLLOW DRILL STEEL

BETHLEHEM STEEL

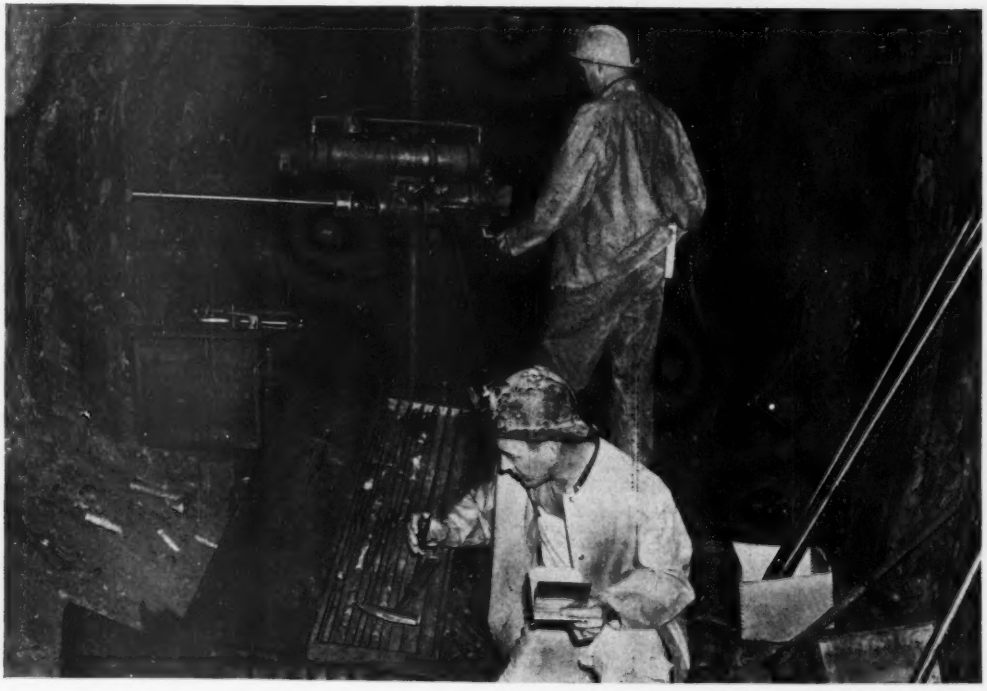
Every type of ROCK DRILL

for modern mining

The compact design of CP ROTORdrifters — with rotary feed motor built into the drill between backhead and drifter cylinder — makes them particularly suitable for close-quarter operations.

CP MOTORdrifters — with feed motor on the end of the shell — are specifically designed for the longer feeds sometimes preferred in large bore tunnels.

Designed both for blast hole and exploratory drilling, the air-driven CP No. 55 DIAMOND CORE DRILL has the most powerful vane-type air motor ever built into a diamond drill. Conservatively rated at 500 feet with E Rods and EX Fittings.



CP-34 STOPERS have all the features that assure maximum footage from tungsten-carbide bits. The combination of strong rotation, fast hitting action, and the right foot-pound blow give maximum penetration and long bit life. Medium weight, fully cushioned piston and fine running balance make the CP-34 easy to handle. Constant air blow keeps all sludge out of the drill.

For the toughest drilling jobs, the heavier CP-44 STOPERS are recommended.

The complete line of CP SINKER DRILLS, ranging from the CP-22 (28-pound) to the CP-50N (102-pound), includes the CP-32, a top performer in the 45-pound class, and the CP-59, leader in the 55-pound class. Both of these can be furnished with the CP AIRLEG, which provides a rigid, well-balanced support and effectively absorbs all recoil.

Designed for maximum speed and efficiency in tunnel driving, the rail-mounted G-600 AIR ACTUATED DRILL JUMBO is furnished in single and multi-boom units.

OTHER CP MINING EQUIPMENT

Exploratory Diamond Drills, gasoline, air and electric powered . . . Wagon Drills . . . Sludge Pumps . . . Sump Pumps . . . Pneumatic Impact Wrenches . . . Stationary and Portable Compressors . . . Pneumatic and Electric Construction and Maintenance Tools.

See CP Mining Equipment at the Mining Show

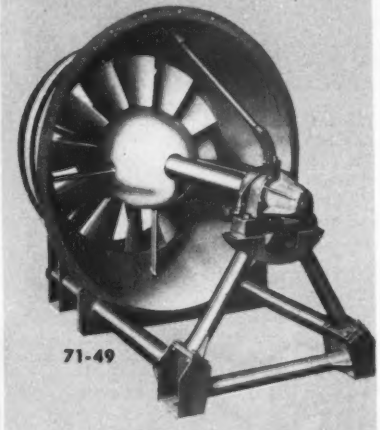
BOOTHS 510 and 514

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

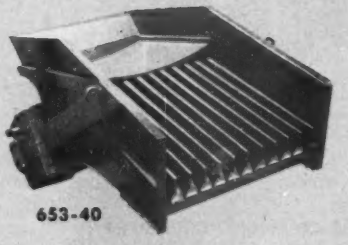
Meet with JEFFREY in



An excellent opportunity to get better acquainted with Jeffrey men, Jeffrey engineering and Jeffrey equipment. Your chance to learn about "Mechanizing for Profit" with Jeffrey units, some of which are pictured here, and will be on display in our booths during the Show.

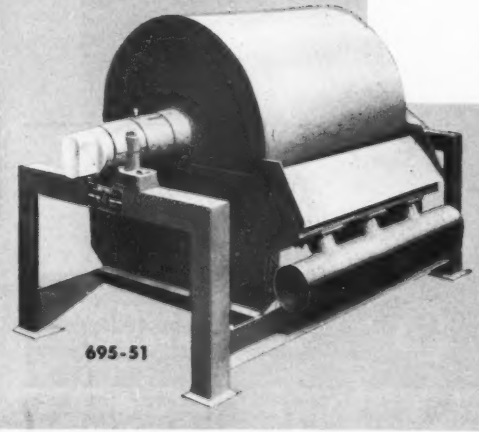
AERODYNE FANS—Shown is the Jeffrey 12-A-58 Fan designed for 13" W. G. maximum pressure—volumes up to 600,000 c.f.m. —internal self-circulating oil lubrication and separate ball thrust bearings. In addition, 1½ and 5 h.p. Blowers (to be used with tubing) will be on display, (see small photo, right-below).

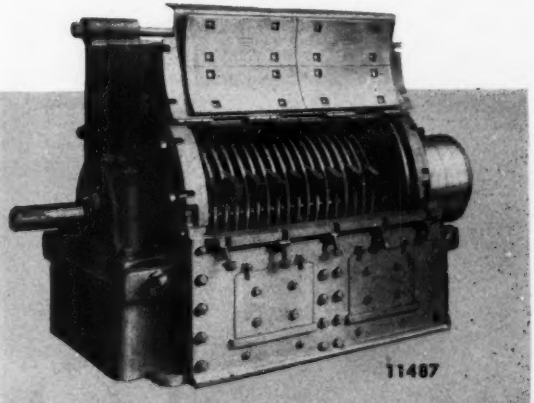
VIBRATING FEEDERS—Grizzly and Pan Feeders of the electric vibrating type in a wide range of sizes and capacities. A series of four, run-around Pan Feeders will be in operation during the Denver gathering. The Grizzly Feeder (left) provides both a feed and non-clogging grizzly in a single unit—is extremely flexible and handles large tonnages.



MAGNETIC SEPARATORS—View, left-below, shows the Jeffrey type CO Magnetic Separator—designed especially for the recovery of magnetic medium in a standard Heavy Media plant. Jeffrey Magnetic Separators are of the drum type, which has the advantage of extreme simplicity. High capacity—minimum of supervision. Bulletin No. 846 discusses Jeffrey designs in detail.

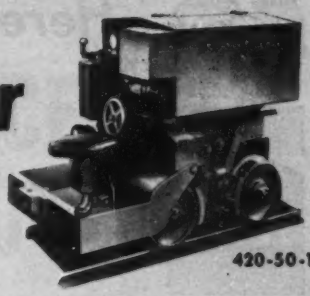
CRUSHERS—The Jeffrey Type B Swing Hammer Crusher is of extra heavy construction—well adapted for severe duty. Being used successfully on limestone, shale, slate, clay, chalk, marl, gypsum, phosphate rock, asbestos rock and others. A 36" x 24" armorplate Swing Hammer Crusher will be on the floor for your inspection.





Denver...in September

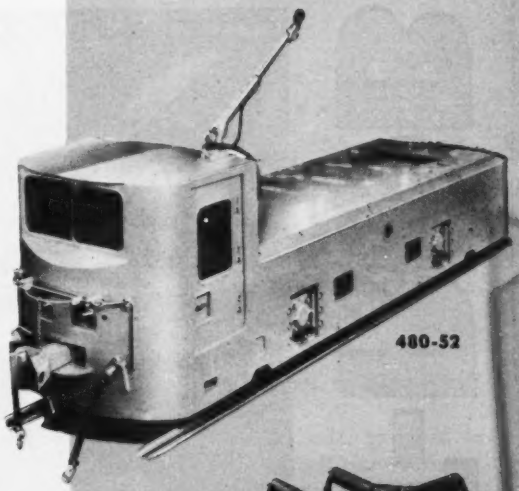
— Booths 307-311-315-319 and 323 —



420-50-1

STORAGE BATTERY TRAMMERS—The Jeffrey Trammer Locomotive is of compact construction and meets all gauges down to a minimum of 18"—has a 6 H.P. motor, weighs 1½ tons. Can be arranged for trolley or cable reel operation. Unit is 34" wide, 46" high and overall length is 62" with hinged motorman's platform. See this unit by all means.

HAULAGE LOCOMOTIVES—Jeffrey 15-ton Trolley Locomotive (below) with these features: air-operated Contactors, Brakes, Sanders and Horn; anti-friction Journals and Axles; Blower to ventilate motors. These dimensions: wheelbase—100", 36" gauge, length—21'8", width—67", height over cab—72", height over covers—44", diameter of wheels—38". Be sure to inspect this modern transportation medium if you attend the convention.

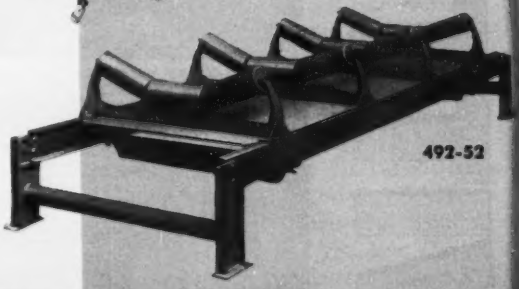


480-52

BELT CONVEYORS—The Jeffrey 80-A Sectional Belt Conveyor with its intermediate sections is frequently used where ore and other material must be carried continuously over long distances. Available in 30, 36 and 42-inch widths—speeds from 175 to 500 feet per minute—capacities up to 18 tons per minute. An intermediate section is shown right-below—and will be at the Show.

420-52

BLOWERS
5 H. P. AERODYNE MIDGET Blower
Free Delivery Volume —6200 C. F. M.



492-52

Don't forget — we'll be looking for you in September

THE JEFFREY MANUFACTURING COMPANY
974 North Fourth St., Columbus 16, Ohio
Established 1877

1877 75 1952

HEWITT-ROBINS

Here's How You Can Get . . .

CONTINUOUS FLOW.. GREATER OUTPUT..

ONLY HEWITT-ROBINS IS ABLE TO TAKE SINGLE UNIFIED RESPONSIBILITY FOR A

..LOWER MAINTENANCE....
..LOW-COST TRANSPORTATION

In Your Mine Or Mill

Conveyorize Your Operations With
HEWITT-ROBINS BELT CONVEYORS

The Hewitt-Robins Belt Conveyorizing method for handling ores, concentrates and tailings offers you a new and better way to increase output and decrease costs in your underground or open-face mine and mill.

Hewitt-Robins Belt Conveyors for stope, gathering, slope and surface are heavier, sturdier. They are specially designed and constructed to carry ores and other heavy materials at a fast, continuous flow.

Some of the many other advantages to be gained from conveyorizing your operations with Hewitt-Robins Belt Conveyors are: "Packaged" installation . . . each conveyor is specially designed and constructed to match your particular requirements from a wide selection of standard component parts.

Most important of all . . . Hewitt-Robins, and *only* Hewitt-Robins is prepared to assume single, unified responsibility for successful operation. Because, Hewitt-Robins is the *only* company that manufactures within its own corporate structure both the specialized machinery *and the belt!*

No other organization is better prepared to offer you the advantages of belt conveyorizing. For Hewitt-Robins, originator of the rubber-covered belt, troughing idler and many other basic developments, has a world-wide reputation as the leader in design, construction and installation of belt conveyor systems.

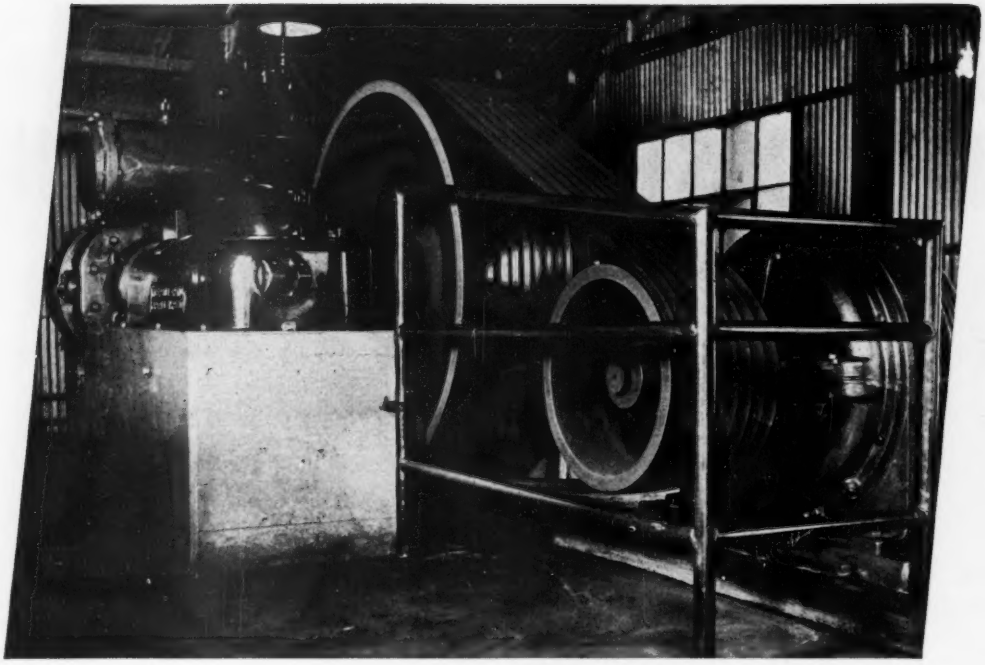
Learn how your operation can benefit from Hewitt-Robins Belt Conveyorizing. Write us the details of your bulk materials handling problems and we will show you how Hewitt-Robins Belt Conveyors provide the answer. We also can assist with your processing problems, for in addition to belt conveyors we manufacture vibrating screens, dewatering equipment and screen cloth.

HEWITT-ROBINS **INCORPORATED**

STAMFORD, CONNECTICUT

402 Randolph St., Chicago 6, Ill. **718 E. Howard St., Hibbing, Minn.** **117 E. Colorado St., Pasadena, Cal.**

BELT CONVEYOR INSTALLATION—ONLY HEWITT-ROBINS MANUFACTURES BOTH MACHINERY AND BELT



Keep your production in the groove with **Thermoid V-Belts**

Production men, in all kinds of industries, rely on the greater strength and longer life in Thermoid V-Belts to provide smooth, efficient performance and long wear . . . keep production in the groove.

From huge multiple V-Belts of rayon grommet construction to the smallest fractional horsepower belts, you can always depend on Thermoid quality.

The result is V-Belts with minimum stretch and extreme flexibility . . . designed to transmit maximum power without slippage . . . able to withstand high speeds and absorb shock.

All these advantages add up to lower operating and maintenance costs, and in the long run, the most economical V-Belts you can specify for the job.

Call your nearest Thermoid distributor today. He has a complete range of sizes to meet your requirements. And for your special V-Belt problems, experienced Thermoid Sales Engineers are always ready to help you.

Thermoid
Industrial Rubber Products
Quality Service

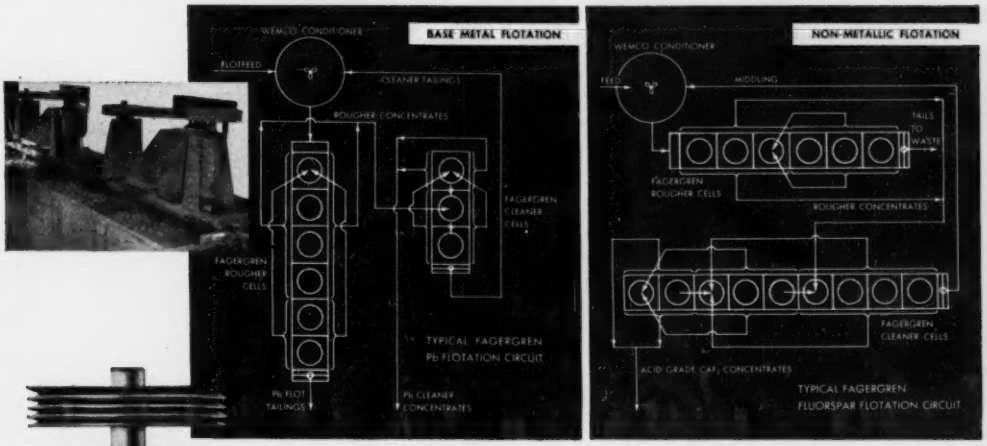
Conveyor & Elevator Belting • Transmission Belting
F.H.P. & Multiple V-Belts • Wrapped & Molded Hose

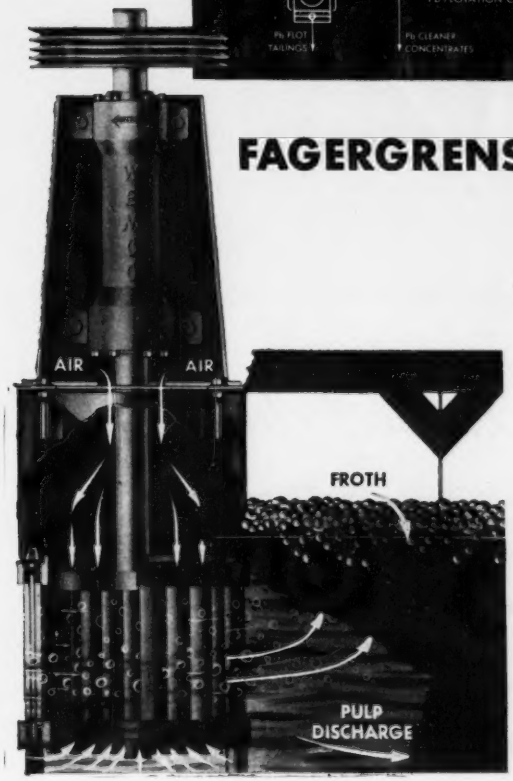
Thermoid

Rubber Sheet Packings • Molded Products
Industrial Brake Linings and Friction Materials

Thermoid Company • Offices & Factories: Trenton, N. J., Nephi, Utah

These Flotation Flowsheets prove it!





FAGERGRENS give greater flexibility of cell arrangement!

These typical flowplans demonstrate the outstanding features of WEMCO's Fagergren Flotation machine: flexibility of cell arrangement. Fagergren cells are arranged for product transfer by gravity flow, on one floor level and **without the use of auxiliary pumping equipment.**

In medium size and small circuits, Fagergrens provide high metallurgical efficiency in cleaner, recleaner and rougher operations by recirculation of flotation products. This efficiency and the unequaled flexibility of cell arrangement give you these seven advantages:

- *low installation cost*
- *low operating cost*
- *high metallurgical efficiency*
- *large capacity*
- *minimum attendance*
- *minimum maintenance*
- *low reagent cost*

Write today for further information on how Fagergren flexibility can improve your flotation results.

OTHER WEMCO PRODUCTS

Mobil-Mills • Coal Spirals • HMS Thickeners
HMS Pumps • Densifiers • Cone Separators
Drum Separators • Fagergren Laboratory Units
Fagergren & Steffensen Flotation Machines
Hydroseparators • HMS Laboratory Units
Dewatering Spirals • Agitators • S-H Classifiers
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WEMCO
WESTERN MACHINERY COMPANY
760-766 FOLSOM STREET · SAN FRANCISCO 7, CALIFORNIA

Priceless Imperfection

Even without its priceless imperfection, the diamond would still be nature's supreme cutting element. Its billions of atoms are compressed into a perfect crystalline structure which for compactness, hardness, and cutting power is without peer.

Perfect—but for one priceless imperfection. Allied to each cleavage plane is a tough vector or "rib" known to the ancients and to every diamond setter as the world's greatest cutting edge.

It is the aim of all good diamond setters to locate these structures and set them "toward the work" so that the driller can use all of their incomparable cutting power.

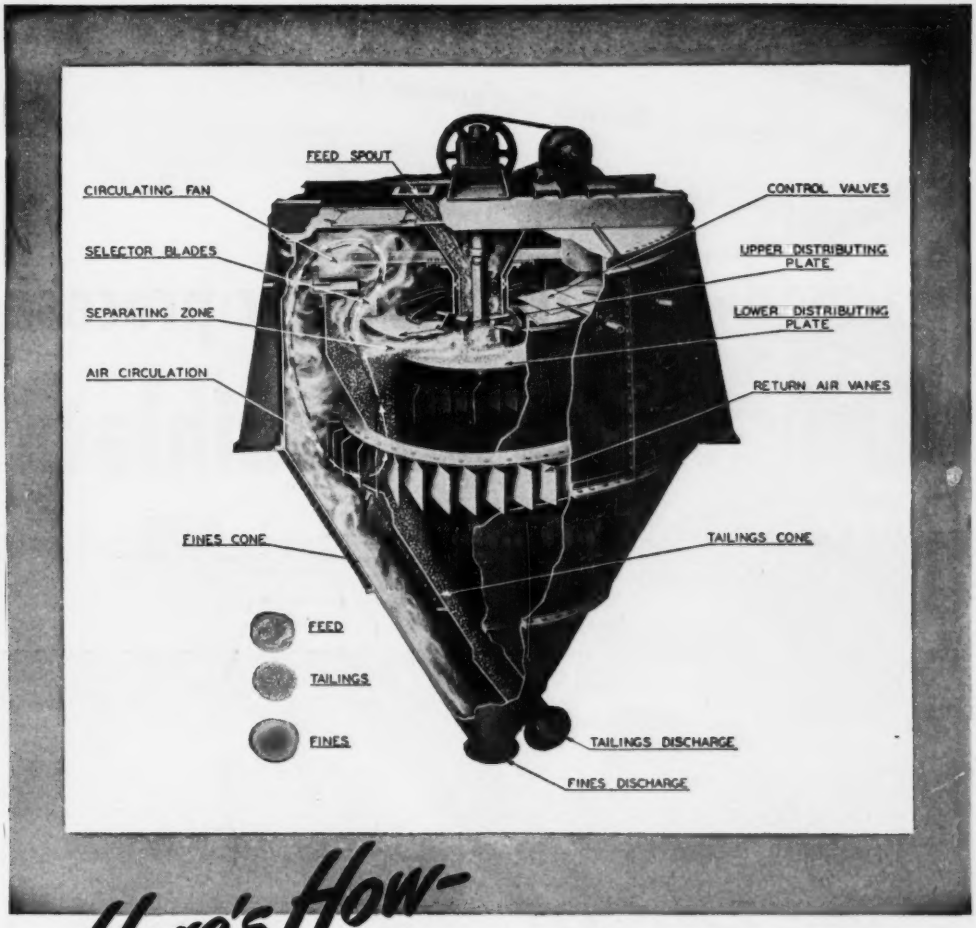
In the manufacture of Truco Diamond Drill Bits, diamonds containing such a visible vector have always been set with this tough fused section toward the work—a major reason why Trucos have always delivered maximum footage at minimum cost.

WHEEL TRUEING TOOL COMPANY

3200 W. DAVISON AVENUE, DETROIT 6, MICHIGAN

WHEEL TRUEING TOOL CO. OF CANADA, LTD.

575 LANGLOIS AVENUE, WINDSOR, ONTARIO, CANADA



Here's How—

STURTEVANT AIR SEPARATORS

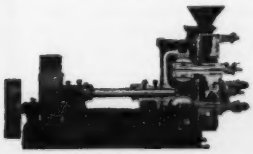
Produce accurate fines with increased output up to 300%

Exact regulation and control of centrifugal forces and air currents, one counteracting and overbalancing the other so precisely that by simple adjustments a product of almost any desired fineness is selected and collected, while coarser sizes are rejected . . . that's the principle of operation of Sturtevant Air Separators.

The benefits you derive from this separator are—increased output by as much as 25% to 300% . . . lower power costs by 10% to 50% . . . reduced maintenance.

A typical on-the-job example is as follows—a 16 ft. separator takes a feed of 750 tons per hour containing only a small percentage of the desired product and delivers 30 tons of material 90%, minus 200 mesh.

Investigate Sturtevant Air Separators today. Write for information and bulletin.

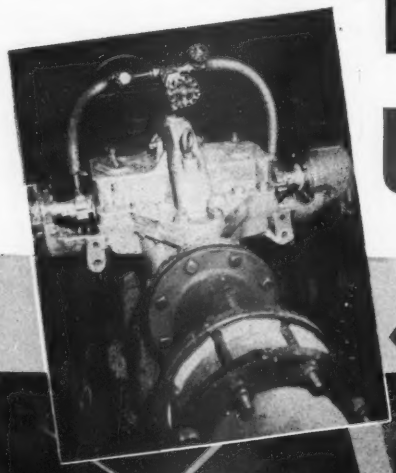


RING ROLL MILL

Capacities from 12 to 18 tons per hour. Range 10 to 200 mesh. Use this mill in closed circuit with Sturtevant Air Separators.

STURTEVANT
MILL COMPANY
101-A *Clayton Street, Boston 22, Massachusetts*
Designers and Manufacturers of
CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS
MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

In this new process U·S·S Stainless



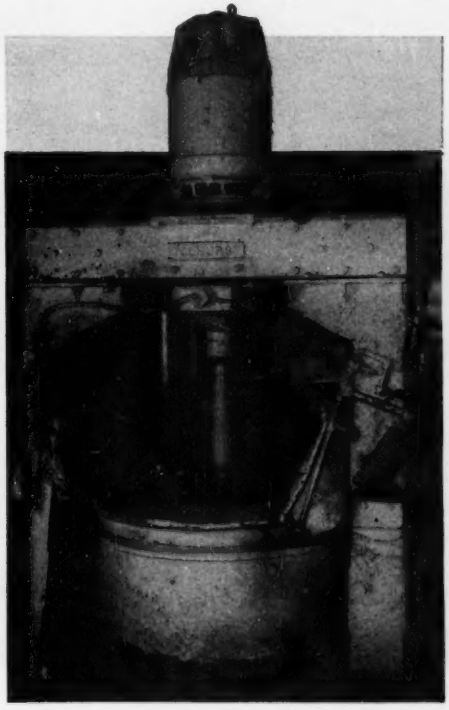
ONE OF THE large copper producers in the Southwest uses Stainless Steel pumps to move copper sulphate solution from dump to reaction cells in the "cement copper" process. A Stainless Steel clamshell bucket is used to load the moist, almost-pure copper after recovery.

STAINLESS STEEL was used for all contact parts on Dorr Thickeners, Classifiers and Suction Pumps shipped to Cyprus Mines Corporation for use in acid leaching oxide copper and brightening copper sulphide materials ahead of flotation.

*Headline from Engineering & Mining Journal, June, 1952.

for refining metals by chemistry

Steel can play a major role



NO doubt you read the article describing these new techniques of treating ore and concentrates by chemical methods instead of conventional smelting and refining processes. They involve a bringing together of two great industries—metal mining and chemical processing—on a greater scale than ever before.

When considering these new techniques from an equipment standpoint, isn't it logical to look closely at a material of construction that has proved its usefulness in *both* the mining and chemical industries? That material is U·S·S Stainless Steel.

The corrosion resistance of Stainless Steel makes it exceptionally well suited for handling many types of acids and salts. Its dense, smooth surface makes cleaning quick and easy. And it has the durability to assure long equipment life under the most severe service conditions.

The applications shown here are typical of current uses of Stainless Steel in metal recovery. Some approximate conditions that may be encountered in chemical processing of ores and concentrates.

If you are investigating chemical recovery of metals, it will pay you to consider equipment made of Stainless Steel. Of course, each application of Stainless Steel must be judged on its own merits. To that end, our representatives will be glad to discuss with you the various grades of U·S·S Stainless Steel and their respective properties. Contact our nearest sales office.

IN DRYING metal powders at the Carteret, N. J., plant of American Metal Company, Limited, two Stainless Steel centrifugals have given maintenance-free service for years. The plant uses Stainless Steel in a wide variety of applications.

UNITED STATES STEEL COMPANY, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S STAINLESS STEEL

USS

SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

2-1478

UNITED STATES STEEL

When mining men have seen it in action...

that Pioneer Edge

JOB FACTS—A PIONEER 48″ x 12′3″ Oro Manganese Steel Feeder takes truck-delivered ore from the receiving hopper and delivers it to a PIONEER 5′ x 10′ Heavy Duty Mesabi Scalping Screen. The screen, in turn, feeds a 30″ x 42″ PIONEER Jaw Crusher, set at approximately 4″, which reduces any scalping screen oversize. A 24″ x 40′ PIONEER Pickup Conveyor carries both the undersize and crusher product to a 30″ x 84′ PIONEER Super Service Conveyor which drops the crushed ore into the track loading pocket.

BUY BOTH!
HIGHER OUTPUT
LOWER UPKEEP

Pioneer

Continuflo EQUIPMENT

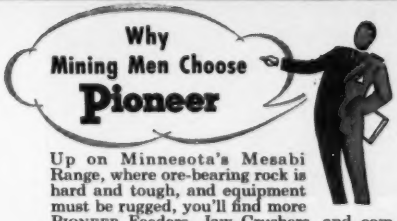
is a natural choice

Moore picks Pioneer equipment for new Judson Mine

● Fast, efficient, low-cost production was what the W. S. Moore Co. wanted when it opened its new Judson Mine near Buhl, Minnesota . . . and that's just what it got!

Moore, an experienced mining firm, had used PIONEER crushers, screens, and conveyors before, and knew it could count on longer life and extra tonnage from this rugged equipment. It was natural, then, for it to choose PIONEER for this important new assignment.

This plant soon earned a reputation as one of the highest producing installations on the Mesabi. Since it went into operation in July, 1951, it has consistently turned out more than 200 long tons an hour of minus 5″ product with 30% crushing. Output has been steady, maintenance almost negligible . . . another example of the famous PIONEER EDGE in action.



Up on Minnesota's Mesabi Range, where ore-bearing rock is hard and tough, and equipment must be rugged, you'll find more PIONEER Feeders, Jaw Crushers, and complete washing plants than all other makes combined.

Why? The answer is the PIONEER EDGE . . . the extra operating margin which guarantees *greater output* and *lower upkeep* to the experienced mine operator.

PIONEER ENGINEERING WORKS
1515 Central Avenue • Minneapolis 13, Minnesota
(SUBSIDIARY OF POOR & COMPANY • CHICAGO)

● Please send me information on the equipment checked.

☐ JAW CRUSHERS	☐ WASHING PLANTS	☐ MECHANICAL FEEDERS
☐ ROLL CRUSHERS	☐ BITUMINOUS PLANTS	☐ VIBRATING SCREENS
☐ ROCK PLANTS	☐ APRON FEEDERS	☐ BUZZER SCREENS (LIGHT DUTY)
☐ GRAVEL PLANTS	☐ ORO FEEDERS	☐ CONTINUFLO CONVEYORS

*Name*_____

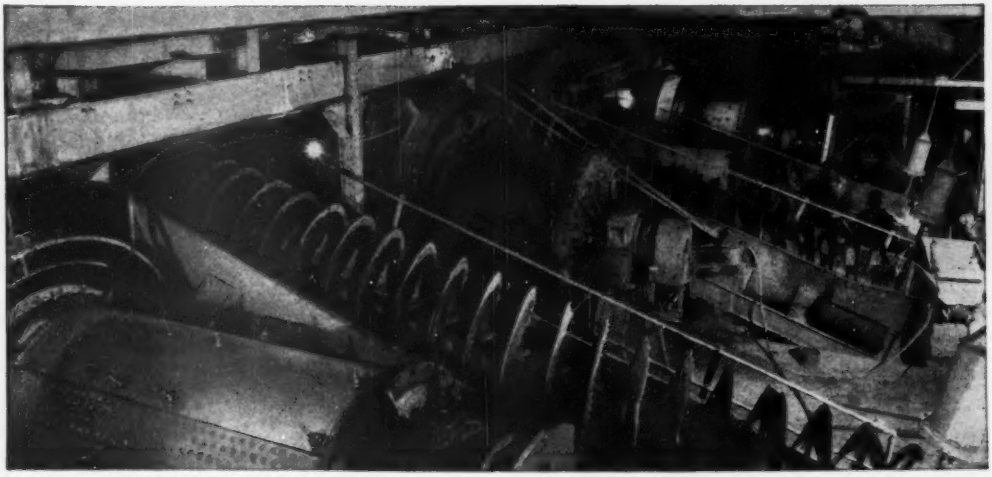
*Company*_____

*Address*_____

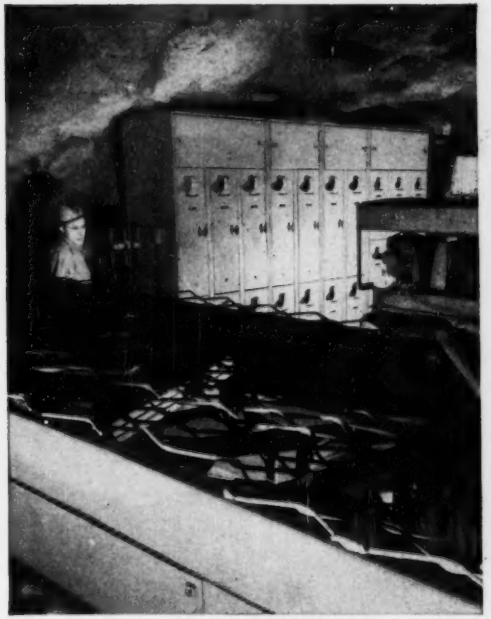
*City*_____ *Zone*____ *State*_____

1 HAULING CARS OF LEAD-ZINC ORE up to 15° slope to the underground mill is this 72" drum hoist, driven by G-E 300-hp 440-volt motor and control. Only one of its kind, the Gilman lead and zinc mill was built entirely underground because in the mountainous terrain surrounding it there is not enough level country. Several hundred feet down, in rooms cut out of hard rock, crude ores from the adjacent mine are concentrated for smelting at distant plants.

Underground lead and zinc mill



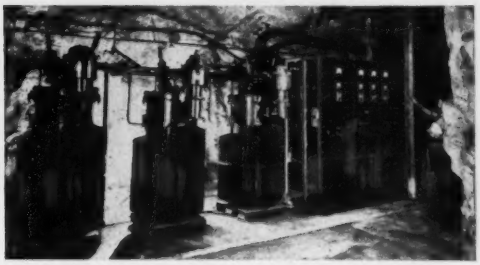
2 IN THE UNDERGROUND GRINDING ROOM, two 100-hp and two 75-hp 440-volt G-E motors and control drive grinding mills. Classifier drives consist of four 10-hp G-E motors and control. Naturally heated to 83F, water for grinding process is pumped from mine to mill by G-E induction motors.



3 GROUPED MOTOR CONTROL is provided at several points throughout the mill by compact G-E Cabinetrol† units. Space-saving Cabinetrol "packages" include all controls and instruments needed for various milling processes. This neat assembly, together with its associated push-button stations, is located in the mill's flotation cell room.

†Reg. trade mark of General Electric for enclosed control panel equipment.

4 AFTER GRINDING THE ORE, lead minerals are separated from zinc minerals and waste, and then zinc minerals are separated from waste tailings in flotation cells. Air for flotation cells is supplied by these blowers, driven by three 125-hp 440-volt G-E a-c motors, with G-E control at right.



5 POWER FOR THE MINE comes down from the surface at 13,800 volts through 4500 feet of G-E armored cable. At this substation—comprising a G-E switchboard and three 150-kva Pyranol* transformers with gas absorbers—it is stepped down to 440 volts for utilization throughout the mine's two lowest levels.

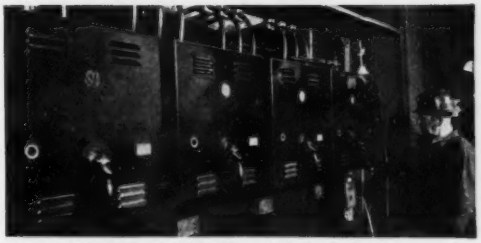
*Registered trade mark of General Electric Co. for askarel.

hits 1200 tons per day!

Co-ordinated G-E drives and distribution equipment help maintain continuity of production at New Jersey Zinc's unique Gilman, Colo. concentrating plant

You, too, can benefit from the kind of G-E application engineering that went into this installation. Call your nearby G-E Apparatus Sales Office and ask for a mining industry specialist. He'll help you solve your electrical problems in mining, concentrating, smelting and refining—efficiently, economically. Call him soon! General Electric Company, Schenectady 5, N. Y.

660-23



6 TO PROTECT EQUIPMENT against damage from excessive overcurrents caused by heavy overloads or short circuits, the mill uses four G-E 3-pole air circuit breakers, rated 600 amperes, 600 volts. G-E air-circuit breakers, selected for adequate interrupting capacity, help safeguard against loss of production in all milling operations.

Engineered Electrical Systems for Mining Industry

GENERAL ELECTRIC

Use these "Agents"

FOR BEST RECOVERIES

Frothers

HERCULES YARMOR® F PINE OIL
Standard of quality among pine oil frothers since the early days of flotation. Yarmor F Pine Oil produces a strong froth of good volume, satisfactory texture, and excellent cell-life stability.

Collectors

RADA (Hercules Rosin Amine D Acetate)
Siliceous mineral collector that has good solubility and handles easily.

Rosin Amine Derivatives: Special purpose collectors; uses vary with type of materials to be floated.

Technical information on these and other flotation aids is available. Send for 16-page booklet "Flotation and Hercules Flotation Agents."

HERCULES Flotation Agents

HERCULES POWDER COMPANY Naval Stores Department, 933 King Street, Wilmington 99, Delaware

NM52-1

Grinding copper ore, this overflow type ball mill is driven by a 600-hp, 100%-pf, 200-rpm synchronous motor.

To Keep Your Mills on the Job!

Continuous grinding is possible only if your motors are capable of continuous, trouble-free operation. Your mills can be no better than the motors that drive them.

ALLIS-CHALMERS has had more than half a century of experience building both motors *and* mills and is fully acquainted with the demands made on the driving motors. That's why it's wise to specify Allis-Chalmers synchronous motors for your mills.

ENGINEERING ASSISTANCE

The best time to start taking advantage of this engineering experience is in your early planning stages. In that way you can be assured of the power factor and torques that will fit your load and power supply requirements.

These electrical characteristics will then be built into a substantial mechanical structure engineered to serve you year after year with a minimum of maintenance. Each motor will have a sturdy fabricated steel stator yoke . . . securely held armature and field coils processed for long insulation life . . . liberally proportioned bearings . . . and many other features that contribute to uninterrupted operation.

Of course you will also get the low cost and the high efficiency characteristic of synchronous motors for these low speed, grinding mill drives.

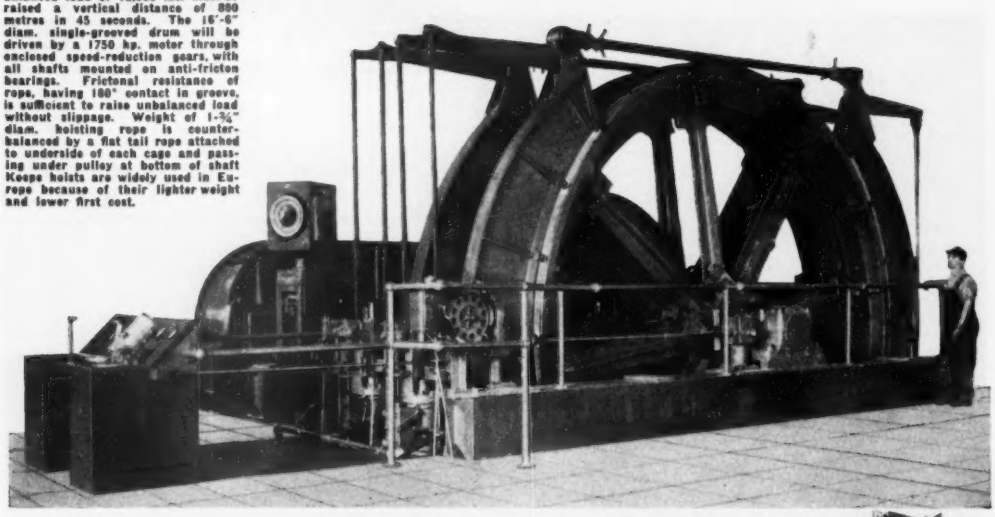
WRITE FOR BULLETIN

Construction details and ratings available in large, low speed, pedestal-bearing synchronous motors are given in our *new* illustrated bulletin, 05B7648. Ask your nearby A-C representative for a copy of this helpful bulletin, or write to Allis-Chalmers, Milwaukee 1, Wis.

A-2568

ALLIS-CHALMERS A-C ALLIS-CHALMERS

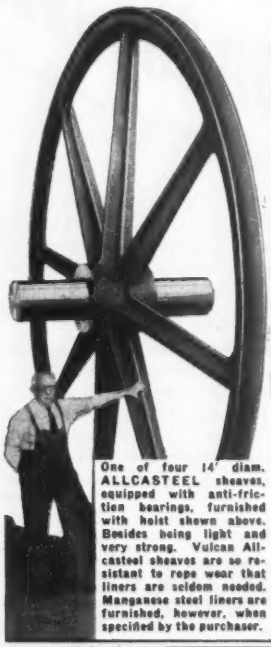
"Koepe" hoist recently designed and built for high-speed balanced hoisting in a European coal mine. Unbalanced load of 12,580 lbs. must be raised a vertical distance of 880 metres in 45 seconds. The 16'-6" diam. single-grooved drum will be driven by a 1750 hp. motor through enclosed speed-reduction gears, with all shafts mounted on anti-fricton bearings. Frictonal resistance of rope, having 180° contact in groove, is sufficient to raise unbalanced load without slippage. Weight of 1-¾" diam. hoisting rope is counterbalanced by a flat tail rope attached to underside of each cage and passing under pulley at bottom of shaft Koepe hoists are widely used in Europe because of their lighter weight and lower first cost.



HEAVY-DUTY HOISTING EQUIPMENT

Designed and Built

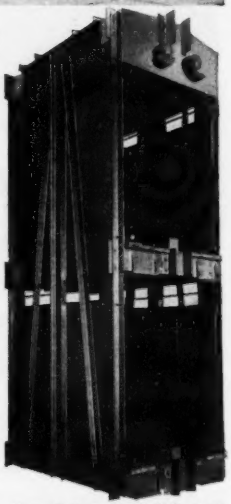
To Meet ANY Specified Requirement



One of four 14' diam. ALLCASTEEL sheaves, equipped with anti-friction bearings, furnished with hoist shown above. Besides being light and very strong, Vulcan Allcasteel sheaves are so resistant to rope wear that liners are seldom needed. Manganese steel liners are furnished, however, when specified by the purchaser.

During more than a hundred years of continuous operation, the Vulcan Iron Works of Wilkes-Barre has designed and built so many different types of heavy-duty hoists that our engineers now meet practically any requirement with a background of experience along comparable lines that assures better results and quicker delivery than would otherwise be possible. Unusually complete manufacturing facilities, developed especially for this type of work, permit maintaining the highest possible standards of quality at competitive prices.

Correspondence is invited regarding any present or prospective requirement for modern hoists, sheaves, cages, skips, or other hoisting equipment. Illustrated bulletins, containing detailed information mailed promptly on request.



One of four double-deck cages furnished with hoist shown above. Each deck carries two mine cars. Heavy construction throughout, with extra-heavy thimbles, chains and safety devices, assures long service life with minimum maintenance expense.

Vulcan Iron Works

ESTABLISHED 1849

Cable Address "Vulworks, Wilkes-Barre"

WILKES-BARRE, PA.

New York City Office, 50 Church Street

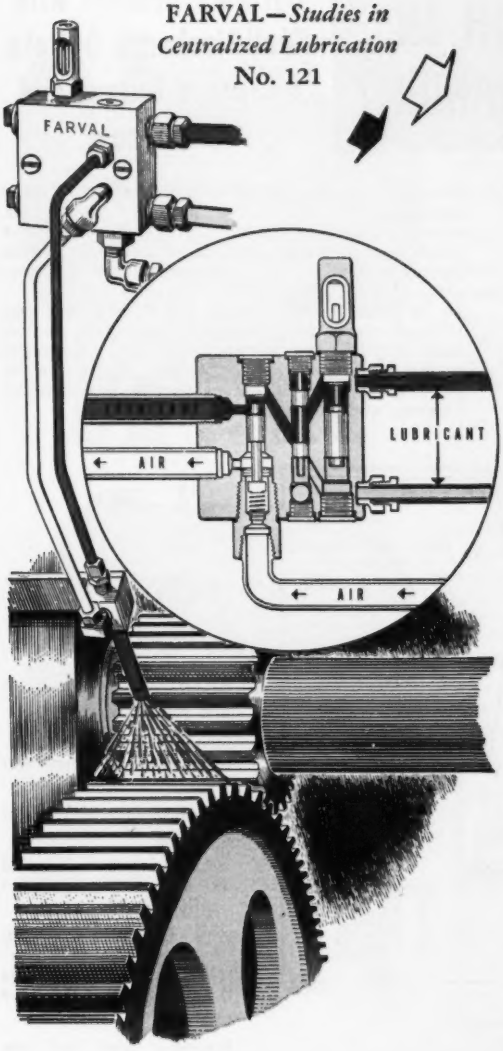
DESIGNERS AND BUILDERS OF ELECTRIC HOISTS, CAGES, SKIPS, SHEAVES, ETC., CONVEYORS, ROTARY KILNS, DRYERS, ETC., AND ALL TYPES OF MINING LOCOMOTIVES

SEE OUR FOUR-PAGE INSERT IN THE McGRAW-HILL MINING CATALOGUES.

FARVAL—*Studies in Centralized Lubrication* No. 121

FARVAL SPRAY VALVE

meters lubricants to slide surfaces and open gearing



THE value of controlled spraying of lubricant on open gearing, slide surfaces, etc., with the Farval Spray Valve is proved by two years' successful experience in hundreds of plants.

By an ingenious adaptation of the familiar Farval Dualine Valve, either grease or oil is sprayed through a nozzle—on any desired area, in any desired amount, and at any desired interval. The spray valve unit can be added at any point in a regular Farval Dualine System wherever compressed air is available—or a complete system may consist entirely of spray valves, served by either manual or automatic central pumping unit.

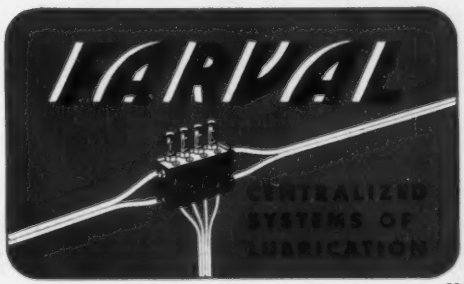
Compressed air from the supply line is directed through the spray valve, which meters air to the delivery nozzle just as lubricant is metered. By a unique arrangement, the lubricant valve also turns on and shuts off the air. Thus the quantity of air used is limited to the amount needed to spray each delivery of oil or grease, without exhausting or reducing pressure. Positive cut-off of lubricant by the Farval valve after each delivery eliminates bleeding from the nozzle—no waste, no mess, no trouble.

The Farval Spray Valve has been thoroughly tested in service and is now in use on a wide variety of machines and equipment. It has demonstrated its ability to supply lubricant efficiently and economically to open gearing, slide surfaces, in fact, wherever a standard Farval Dualine closed system is not readily adaptable.

Write for a copy of Farval Spray Valve Bulletin No. 60 for a full description, with illustrative diagrams and installation data. The Farval Corporation, 3281 East 80th Street, Cleveland 4, Ohio.

Affiliate of The Cleveland Worm & Gear Company, Industrial Worm Gearing. In Canada: Peacock Brothers Limited.

These diagrams illustrate the action of the Farval Spray Valve in delivering a measured quantity of oil onto open gearing. One or more spray valves can be incorporated readily into any Farval Dualine System. Or spray valves can be installed independently, served by their own Farval manual or automatic central pumping unit.



When you are at the Denver Mining Show, September 22-25, stop at Booth 1017 to get better acquainted with Farval Centralized Lubrication and Cleveland Worm Gear Speed Reducers.

AGAIN... KENNEDY PRESENTS AN INNOVATION IN CRUSHING EQUIPMENT!

NEW

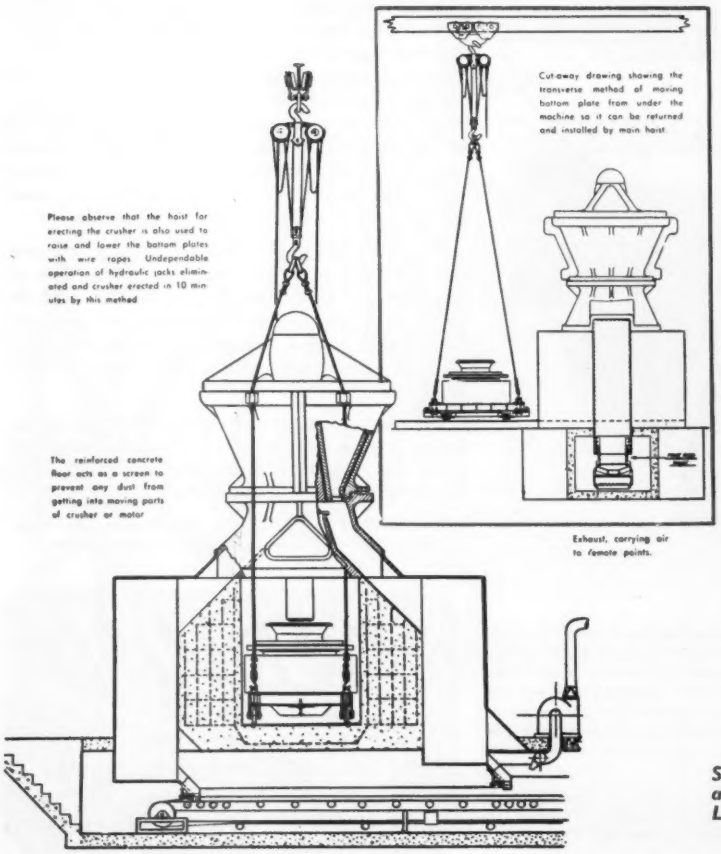
Gyratory Crusher with Dual Discharge Outlets Increases Output and Efficiency

Only KENNEDY has the correct answer to the "Sticky Ore" problem! KENNEDY Gearless Gyratory Crushers are now built with TWO DISCHARGE OUTLETS plus an exclusive "No-Stick" feature that increases efficiency and output. This distinct innovation in crusher design is another "FIRST" for the world-famous line of KENNEDY crushing equipment.

Hard-to-crush rock and ore such as limestone, trap rock, basalt, taconite, slag, etc., containing as high as 50% clay, can be handled without sticking or clogging by the exclusive KVS process.

No other crusher offers this advantage. Double discharge outlets, built at angle of 70 degrees, assure uninterrupted delivery of material. Other crushers, with single 42 degree outlets, cannot compare because the discharge outlet becomes clogged with sticky clay or taconite ore.

In the new KVS crushers, rock and ore pass through mantle and concaves at bottom. A vertical drop of 6 feet then quickly and surely disgorges sticky clay, etc.—greatly speeds production by eliminating clogging—saves countless man hours clearing stalled crushers.


Cut-away drawing showing the transverse method of moving bottom plate from under the machine so it can be returned and installed by main hoist.
Please observe that the hoist for erecting the crusher is also used to raise and lower the bottom plates with wire ropes. Undependable operation of hydraulic jacks eliminated and crusher erected in 10 minutes by this method
The reinforced concrete floor acts as a screen to prevent any dust from getting into moving parts of crusher or motor
Exhaust, carrying air to remote points.

CHECK THESE FEATURES!

Synchronous motor built into pulley assembly

Smooth frictionless operation because the crusher is gearless

Power used ONLY for crushing

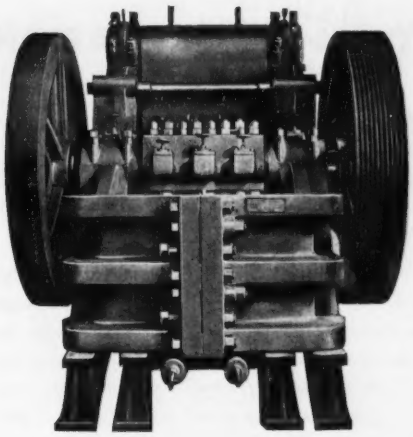
All moving parts carried on self-aligning roller bearings

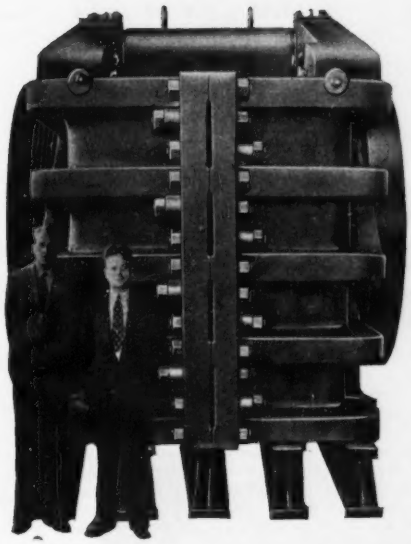
KVS forced-feed oiling system pumps four barrels of oil per hour through bearings without waste

Eccentric and ball are spray babbited. NONE has been rebabbited in over three years

Send for bulletins describing all types of KVS crushers. Let us prove that "It Costs Less To Own The Best".

KENNEDY Swing Jaw Crushers





2-Section Split Frames of Herculite Steel

Built to "Take It" as Well as "Give It"

The strongest heavy-duty crushers ever built! Designed by KVS engineers to handle maximum rock and ore loads . . . built to reduce those "Hard-to-Crush" raw materials with minimum effort and lowest power consumption.

Real gluttons for work . . . versatile, sturdy, ready and able to handle the toughest crushing assignment and ask for more! Dependable under all operating conditions . . . trouble-free . . . constructed to give years of service . . . able to "take it" as well as "give it".

Swing jaws are reversible, end-to-end, side-to-side, to give *twice* the wear of ordinary types. Jaw plates made in one piece; swing jaw shafts cast integral with swing jaws . . . excessive wear eliminated.

All-in-all, the strongest jaw crusher built. Made in various sizes to meet your own specifications. Ask our engineering department to submit operating data, capacities, weights, etc.

Send for illustrated bulletin
describing KVS swing jaw crushers.

EXCLUSIVE FEATURES OF THE KVS SWING JAW CRUSHERS . . .

- Frames built of open hearth or Herculite steel with tensile strength of 60,000 lbs per sq inch
- Counter-balanced fly wheel for lifting pitman at bottom of stroke. Hoisting engine or jacks not required to start machine
- Frames made in two sections, bolted together at centers. Bolts thrown into tension whenever strain develops. This exclusive KVs feature is superior to construction methods where machines are joined at corners.
- Rigid strength of frames; toughness of jaw plates adds years of service to crusher; enables it to better withstand shock and stress of crushing tough rock and ore.

IT COSTS LESS.. TO OWN THE BEST!

KENNEDY - VAN SAUN
MANUFACTURING & ENGINEERING CORPORATION
TWO PARK AVENUE, NEW YORK
FACTORY DANVILLE, PA.

Unloading Hopper Cars

IS A FAST, ONE-MAN OPERATION

Unloading Time

Actual examples with Allis-Chalmers car shaker. Good unloading facilities.

WET SAND
1½ TO 2¼ MINUTES.

ROCK
½ TO ¾ MINUTES
. . . ½ to 6 in. crushed material.

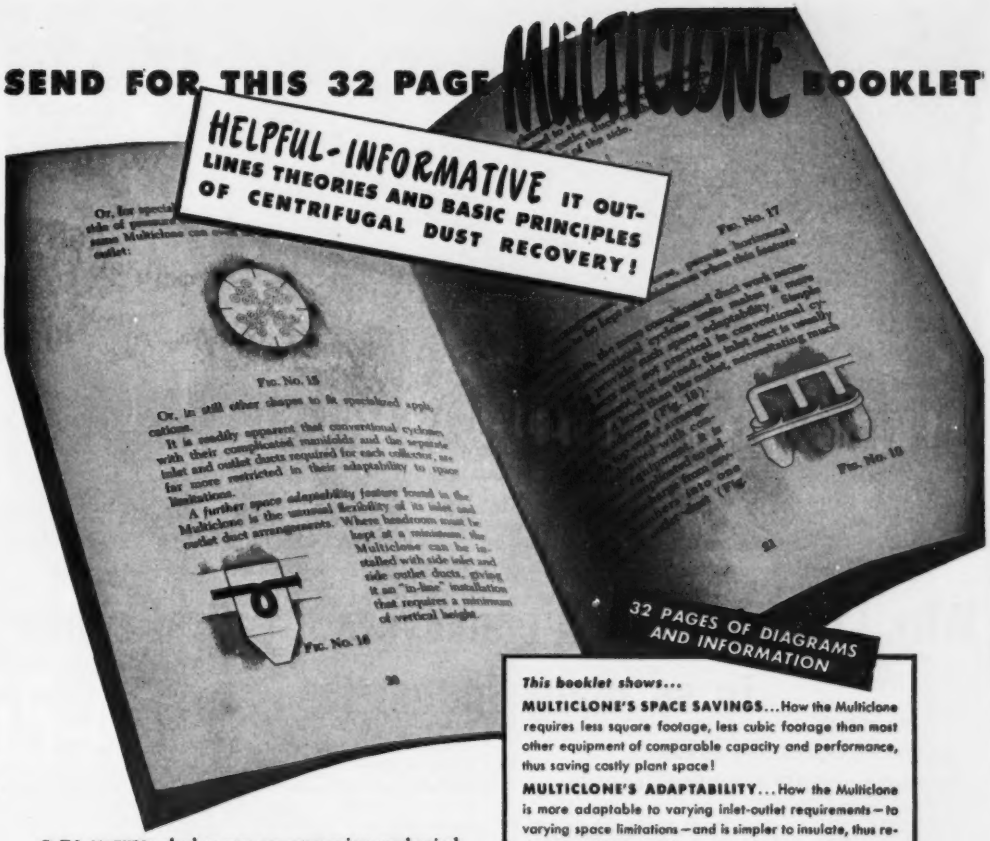
COAL
1 TO 6 MINUTES
. . . depending on surface moisture. ROM to 10 mesh x 0 screenings.

YOU CUT UNLOADING COSTS . . . Push a button and your Allis-Chalmers car shaker will empty a hopper-bottom car in *minutes* . . . and cleanly, too, even if your bulk material is damp, compacted or partially frozen. In addition, it promotes an even flow of material from the unloading station.

YOU REDUCE UNLOADING HAZARDS . . . No workman need enter a hopper car with an Allis-Chalmers car shaker. It isn't necessary, either, to re-position the shaker on the car or to adjust it manually to fit the car. Ask the A-C representative in your area to show you how this car shaker can save money in your operations. Call him, or write: Allis-Chalmers, Milwaukee 1, Wisconsin. A-3637

ALLIS-CHALMERS A-C ALLIS-CHALMERS

SEND FOR THIS 32 PAGE MULTICLONE BOOKLET


HELPFUL-INFORMATIVE IT OUTLINES THEORIES AND BASIC PRINCIPLES OF CENTRIFUGAL DUST RECOVERY!
Fig. No. 15
Fig. No. 16
Fig. No. 17
Fig. No. 18
32 PAGES OF DIAGRAMS AND INFORMATION

NO MATTER whether you are now using mechanical dust recovery equipment or are planning the installation of such equipment at some future date, here is a booklet that is full of helpful and valuable information on centrifugal dust recovery. It not only explains the basic methods and principles involved, but also shows the important differences between small and large diameter separating tubes, shows how to simplify your duct work and reduce installation costs, and outlines many other important factors to be considered in selecting mechanical dust recovery equipment.

In addition, this informative booklet illustrates and explains how MULTICLONE'S unique *vane* design is fundamentally different...how it makes possible greater compactness, simpler installation, high recovery of the small particles as well as the medium and coarser ones, and many other facts on MULTICLONE advanced design.

A limited supply of these booklets is available for free distribution to those interested in mechanical recovery equipment and methods. Write for your copy today.

This booklet shows...

MULTICLONE'S SPACE SAVINGS...How the Multiclone requires less square footage, less cubic footage than most other equipment of comparable capacity and performance, thus saving costly plant space!

MULTICLONE'S ADAPTABILITY...How the Multiclone is more adaptable to varying inlet-outlet requirements—to varying space limitations—and is simpler to insulate, thus reducing installation costs!

MULTICLONE'S EFFICIENCY...How Multiclone's multiple *small diameter* tubes, made possible by its exclusive vane design, give higher centrifugal forces and more complete cleansing of *all* suspended particles—even small ones of 10 microns and less!

MULTICLONE'S LOW MAINTENANCE...How the Multiclone has no high speed moving parts to repair or replace, no pads or filters to clean or renew, nothing to choke gas flow or increase draft losses as suspended materials are recovered. Multiclone draft losses remain uniformly low—recovery efficiencies uniformly high—at all times!

Make sure that a copy of this helpful booklet is in your reference files by sending for your copy now!

NOW SELLING...

COTTRELL Precipitators
MULTICLONE Collectors
TURBULAIRE Spray Dryers

...in all parts of the U. S. A. and foreign countries.

WESTERN Precipitation CORPORATION

ENGINEERS, DESIGNERS & MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

Main Offices: 1012 WEST NINTH STREET, LOS ANGELES 15, CALIFORNIA
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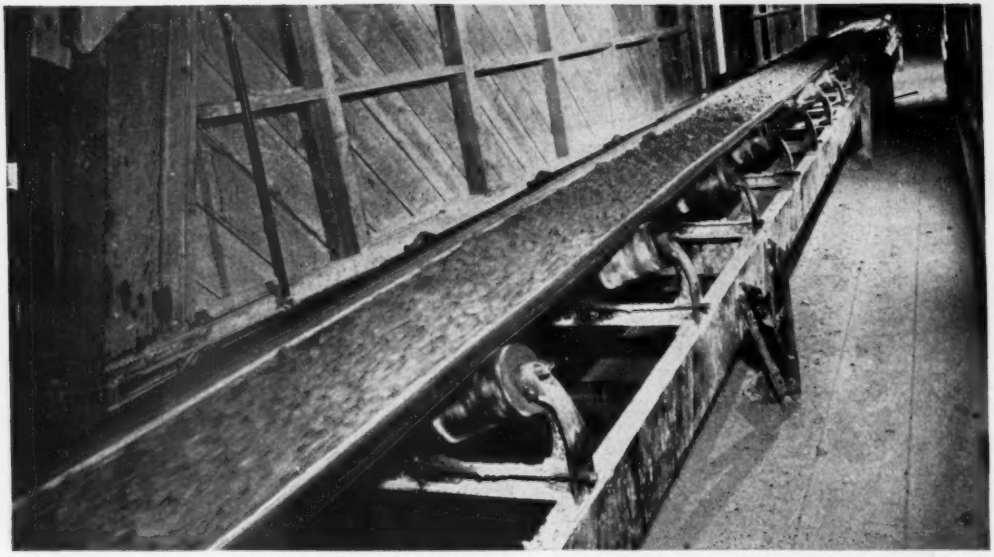
PRECIPITATION CO. OF CANADA, LTD., DOMINION SQ. BLDG., MONTREAL



Crushed and screened lead-zinc ore is carried by this Link-Belt 24-in. wide inclined belt conveyor to 3000-ton capacity mill ore bin.

Why LINK-BELT belt conveyors are first choice in so many industries . . .

Engineering experience plus quality components combine to cut handling costs

EFFICIENCY in moving materials makes the difference between profit and loss in many operations. That's why it's so important to make sure you get the *right* belt conveyor system for your needs.

And there's no surer way of meeting your specific operating requirements than by calling in Link-Belt. Our belt conveyor specialists can efficiently engineer the system and recommend the correct components from Link-Belt's complete line of idlers, trippers and terminal machinery. And Link-Belt can match your needs in associated equipment—other types of conveyors, feeders, elevators, car dumpers and shakers.

Equally important, with such a tremendous background in belt conveyor application, Link-Belt is in an ideal position to follow through on every detail of your job—from planning through erection, if desired. One source—one responsibility.

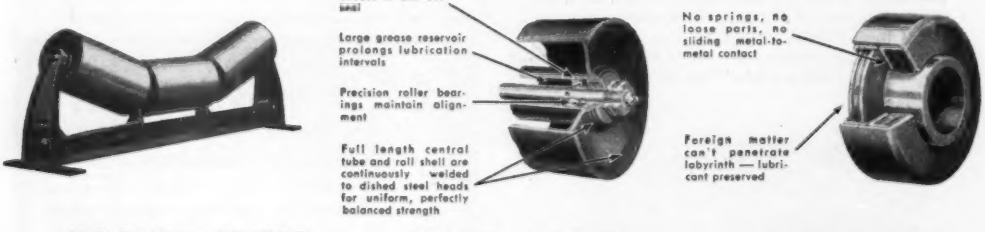
Link-Belt will gladly work with your engineers or consultants. There's a Link-Belt office in the principal city near you.

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, Duluth 2, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices in Principal Cities. 12,720-F

LINK-BELT

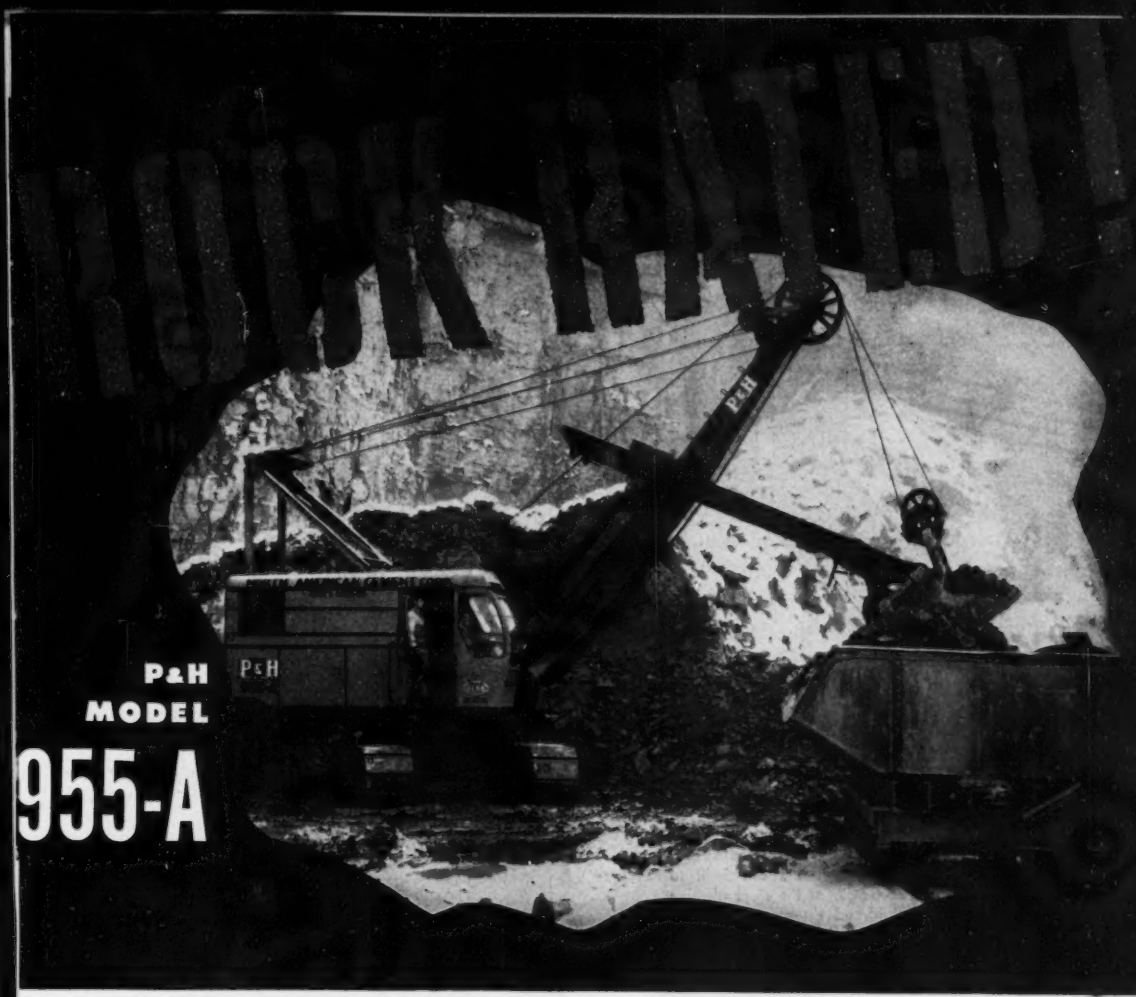
BELT CONVEYOR EQUIPMENT

LINK-BELT Roller Bearing Idlers provide free-rolling, long life


Grease-in-Dirt-out seal
Large grease reservoir prolongs lubrication intervals
Precision roller bearings maintain alignment
Full length central tube and roll shell are continuously welded to dished steel heads for uniform, perfectly balanced strength
No springs, no loose parts, no sliding metal-to-metal contact
Foreign matter can't penetrate labyrinth — lubricant preserved

Standard for Industry—L-B "100" Idler **Less lubrication and adjustment** **Grease-in-Dirt-out Seal**

SEE OUR EXHIBIT — METAL MINING EXPOSITION — DENVER — SEPTEMBER 22-25



P&H MAGNETORQUE* is the electric swing that never wears out

Just what does Magnetorque mean to you in this great 2½ yd. shovel? Simply this: It eliminates the old swing frictions with their constant headaches and replacement costs. It gives you the smoothest, slickest swing you ever saw—15% to 25% faster than any other machine of its size—and Magnetorque will last the life of your machine.

Add to this the rugged, rock-rated construction of welded high tensile steels—the smooth hydraulic control—the greater stability and digging power—and you have the greater output which means greater profit. Better get all the facts about this outstanding machine—companion to the famous P&H 1055 (3½ yds.). Ask about the P&H 955-A today.

*T.M. of Harnischfeger Corporation for electro-magnetic type clutch.

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SHOVELS • CRAWLER AND TRUCK CRANES • OVERHEAD CRANES • HOISTS • ARC WELDERS AND ELECTRODES • SOIL STABILIZERS • DIESEL ENGINES • PRE-FAB HOMES

Largest Dump Cars help

With their 100-ton capacity, roller bearing trucks, strong but light construction, these Western dump cars are built to handle big yardages of the most abusive material. Reinforced double-plate doors can stand plenty of rough usage; welded bed underframes won't twist or distort under heavy loading.

BALDWIN
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BALDWIN

BALDWIN-LIMA-HAMILTON CORPORATION

on the Mesabi OLIVER cut haulage costs

Since the earliest days of the Mesabi, Western dump cars have been popular in the World's largest, open-pit iron mines. Recently, for instance, Oliver Iron Mining Division of United States Steel Company received 76 new 40-yard, 100-ton Western cars—the largest, sturdiest ever used on the range.

There's a good reason why Western dump cars are top favorites. The generous use of high-tensile alloy steels keeps weight low without sacrificing ruggedness and gives an unusually favorable ratio of payload to dead-weight. The center of gravity is also low, so there's no danger of cars jumping the track when under way or during dumping operations. Roller bearings, fast-acting air systems, a foolproof door mechanism and super-strong doors ensure maximum freedom from trouble —minimum time on repair track.

Whenever you need dump cars—side-dump or hopper bottom-dump type—check the Western designs. We'll be glad to tailor-design a car for your particular requirements to give lowest possible haulage costs.

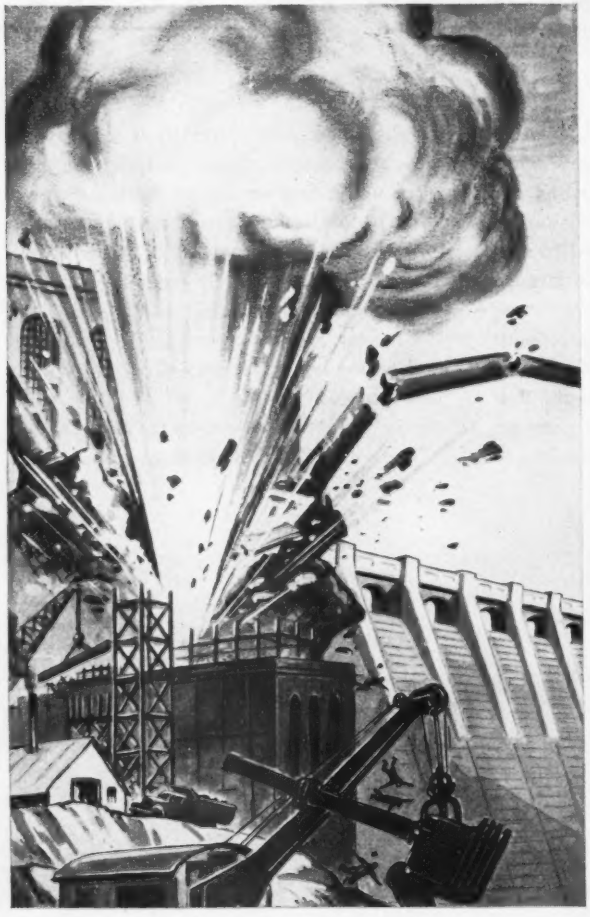
Western 40-yard cars dumping tough Taconite rock. Baldwin cow and calf locomotives (two 800 h.p. units) easily move long trains of these new cars up steep grades, over rough track to the high dumps.

Western —built by the world's largest manufacturers of dump cars

-LIMA-HAMILTON

PHILADELPHIA 42, PENNSYLVANIA • OFFICES IN PRINCIPAL CITIES

EXPLOSION RIPS HYDRO-ELECTRIC PLANT IN BRAZIL: 7 INJURED



A vast construction project nearing completion by an American construction company, today was virtually destroyed by an unexplained explosion. Four American technicians and several natives were seriously injured.

Accidents like this do happen—frequently. When they do, contractors and owners face serious financial loss—perhaps ruin.

That is why it is good business to protect your foreign interests, your property, your equipment and your liability, with sound insurance through the *American Foreign Insurance Association.*

AFIA knows the complex insurance laws, regulations and currency problems in all countries. Its years of specialized experience in the foreign insurance field, combined with the great financial strength of its 24 outstanding American capital stock insurance member companies are your assurances of insurance protection that is unsurpassed.

Ask your agent or broker to get full information from AFIA on any specific risk.

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THIS IS THE DIESEL

for any mining job from 32 H.P. up

Whatever your mining job, there's a General Motors Diesel to supply the power. For General Motors Diesel engines now power more than 260 different models of mining equipment built by over 50 manufacturers.

Widespread demand for the 2-cycle GM Diesel engine results from its ability to get more work done faster and at lower cost. GM Diesel's fast acceleration boosts production. Smooth 2-cycle operation reduces wear and extends engine life. Convenient location of accessories simplifies maintenance. What's more, GM Diesels definitely cost less to maintain and repair because parts cost less, are highly interchangeable and are available everywhere. See your GM Diesel distributor or write us for full information.

DETROIT DIESEL ENGINES DIVISION
GENERAL MOTORS • DETROIT 28, MICHIGAN

It pays to Standardize on

GM
GENERAL MOTORS
DIESEL POWER

SEE OUR EXHIBIT AT THE MINING SHOW
BOOTHS 1305, 1309, 1311 (Aud. Floor)

Finger-tip gearshifting for heavy-duty

Allison TORQMATIC Transmission quick-shifts under load at full throttle—saves time—cuts operating and maintenance costs

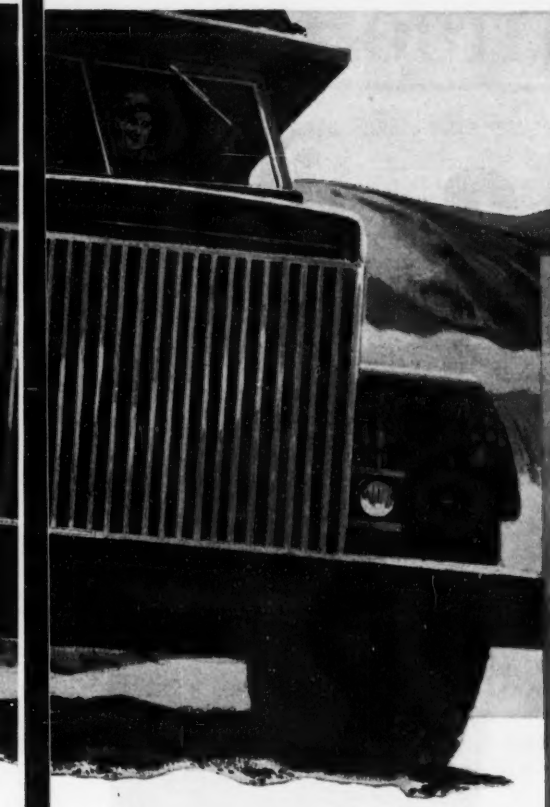
PERFECT teammate for the famed Allison Torqmatic Converter is this Torqmatic Transmission — an exclusive development that takes the work out of gearshifting in even the largest off-highway trucks and heavy earth-moving vehicles.

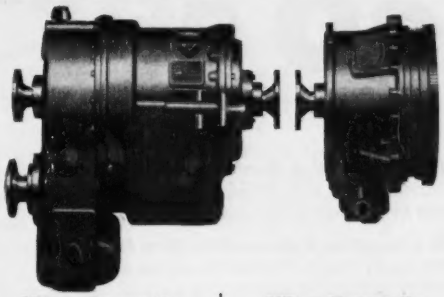
Embodying the same basic design principles as the Allison Torqmatic Transmission, which has long been used in U. S. armored vehicles, this Allison quick-shift transmission eliminates "gearshift guess"—puts an end to laborious clutch pedal pumping and the usual manual gearshifting.

Unlike conventional sliding-gear types, the Allison hydraulically controlled *Torqmatic* is a constant-mesh, planetary-gear transmission. With a simple flick of a lever, the driver can shift from one range to another *at full load without taking his foot from the throttle*—and without losing momentum.

A Smooth Power Flow

Coupled with the cushioning effect and automatic features of the Allison Torqmatic Converter, this transmission greatly extends the torque converter's capacity. This means that trucks up to 50-ton pay load can climb steep grades with the smoothness and operating ease you enjoy with an hydraulic transmission in your car. It cuts maintenance. It increases truck life. It reduces operator fatigue. It enables drivers to handle bigger pay loads on faster schedules. *It gets more work done at lower cost per ton-mile.*





Allison Torqmatic Transmission | **Allison Torqmatic Converter**

UNBEATABLE TEAM
—for maximum operating economy

Quick shifts under load at full throttle

Finger-tip hydraulic gearshift control

Combination needs only three forward speeds with one reverse

Power take-off available. Delivers full engine power

Variety of transfer gear ratios available

Simple design—one-piece cast converter elements—minimum maintenance

Compactness simplifies installation

Designed for power application in the 75 to 350 h.p. range

Longer equipment life—less wear on drivelines, axles, chains, sprockets and gears

A matched team—designed to work together smoothly—designed and built by one manufacturer

vehicles

Yes, here is the profit-winning team for almost any heavy-duty vehicle drive—tested in the world's toughest kind of service and proved by thousands of hours' operation in off-highway trucks, tractors and other heavy equipment. For further information about TORQMATIC DRIVES, write to:

Allison Division of General Motors,
Box 894M, Indianapolis 6, Indiana.

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TORQMATIC DRIVES

WILFLEY
centrifugal PUMPS

30 acres 2 miles

• ***Wilfley Special High Head Sand Pumps*** play an important role in the successful reclamation program of the Hawaiian Commercial & Sugar Co.

• Each year, at the Puunene Mill, 30 to 40 acres of useless, sandy waste land are transformed into productive ground for sugar cane cultivation.

• Soil, removed from mechanically harvested cane by washers, is settled to a sludge of 15% to 25% solids. This sludge, together with a sludge of repulped filter cake, is pumped to the diked waste area. When dry, there remains a 2 to 3-ft. layer of reclaimed cultivable topsoil over the coral sands.

• WILFLEY Pumps, operating on a 24 hour-a-day, trouble-free schedule perform the tremendous task of delivering 300- 500 G.P.M. of cane washer wastes through 2 miles of 6" pipeline to the reclamation area. As a result, wastes which formerly presented a costly disposal problem, are now converted into revenue-producing land.

Wilfley Special High Head Pumps in operation at the Puunene Mill of the Hawaiian Commercial & Sugar Co

Buy rugged, heavy-duty Wilfley Pumps whenever the job calls for the efficient and economical handling of sludges, slimes, slurries or sands. The new WILFLEY Model "K" Centrifugal Sand Pump, embodying many important mechanical improvements, delivers higher efficiencies, stepped-up production, worthwhile power savings and lower operating costs. Easy interchangeability of wear parts. Low maintenance costs. Every application individually engineered. Write or wire for complete details.

A. R. Wilfley & Sons, Inc.
Denver, Colorado, U.S.A.
New York Office: 1775 Broadway, New York City

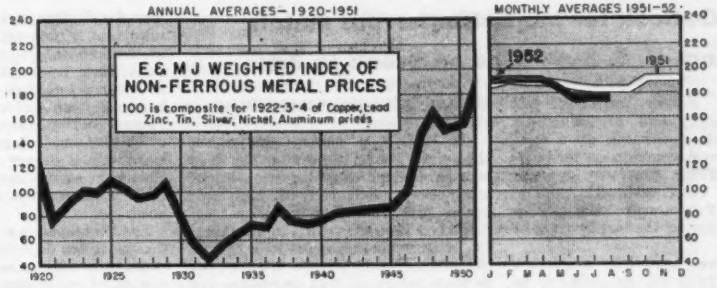
Buy WILFLEY for cost saving performance

Companion to the famous WILFLEY Acid Pump

Upper: Reclaimed land under cultivation
Center: Diked reclamation area
Bottom. Waste land to be reclaimed

E&MJ OUTLOOK

PRICES



MARKETS

With steel mills rolling again, actual consumption of zinc and other basic materials is increasing, but orders for the metal lag. By last month, producers' stocks of zinc had climbed three-fold, driving the price down to 13½c., East St. Louis. Government willingness to buy zinc for stockpiling brought a mild recovery, but the zinc market is likely to be on the easy side for some time to come.

The drop in zinc more than offset higher averages for foreign silver and aluminum. It adds up to a slight drop in the *E. & M. J.* index of non-ferrous metal prices from 179.79 in July to 178.70 in August.

The Government's buffer stockpile of lead was up to about 26,000 tons as the month ended. Demand for lead holds good, but not good enough to call on this GSA metal, which will probably go into the strategic stockpile at the year's end.

The copper rush rolls on, despite the awkward price situation. Assurance of labor peace could bring it up short, however.

•

LABOR

The Phelps Dodge settlement with Mine, Mill (see p. 147) went far to ease the fears of copper consumers that a copper industry strike would cut supplies once more. Settlements at other properties are a good prospect.

Communism in Mine, Mill is at last in for a governmental airing. Senator McCarran's committee will interrogate four MMSW leaders in a Salt Lake City hearing in October.

•

AT HOME

Despite easier credit, and cries of shortage rising out of the steel strike, there's been no great rush to buy cars or other major metal-using appliances. People still are hanging onto their spending money. The steel strike has had the effect of postponing the long-awaited, and feared, peak of defense spending, and business generally should hold up well next year.

A mill and a buying depot for Arizona asbestos is planned by DMPA to develop production there.

Bismuth, manganese, and powdered iron make up a magnet so powerful it may replace Alnico in permanent magnets. That would cut out a big market for cobalt. Navy Ordnance developed the idea.

Look for news soon on **use of ultrasonics to replace industrial diamonds** in machining, drilling, and grinding hard metals and ceramics. Also 40 oil companies doing joint research on drilling, think high-frequency vibration (ultrasonics) shows greatest promise for penetrating rock.

•

ABROAD

The International Monetary Fund isn't likely to raise the price of gold. U. S. opposition to South African and U.K. wishes is too strong. But we still think it's going up sooner or later.

MARKETS—Trends and Prices

Supply Outlook for Major Nonferrous Metals Improving—U. S. Buys Zinc on Break in Price

WITH THE SUPPLY OUTLOOK improving steadily and production of finished goods continuing at a relatively high level, competition for business is increasing. Moreover, the steel situation is righting itself quickly. Production of steel exceeded 2-million tons a week during the last two weeks of August.

Prices were unsettled, aluminum moving up 1¢ a lb. on Aug. 4, to absorb higher costs, with zinc lower because of pressure of expanding stocks in the hands of smelters. Quicksilver also was lower.

The average price of Prime Western zinc was down about 1¢, compared with July. This offset a rise in aluminum and a higher average for foreign silver, and the E&MJ price index of nonferrous metals declined to 178.70 for August, against 179.79 in July and 186.15 in August a year ago.

Industrial production as measured by the index of the Federal Reserve declined in July to 191% of the 1935-39 average. The figure for June was 202 and in July a year ago 212. The fall was expected because of the steel strike that did not end until late in the month.

Zinc Price Falls

The recovery in zinc business was too slow to arrest the upward trend in stocks in the hands of smelters. Without a resumption of buying by galvanizers and die-casters, some operators felt that the gain in stocks would continue unless (1) production falls, or (2) the stockpile again purchases zinc in quantity. The stockpile, as originally conceived, was anything but a price regulator. Nevertheless, some producers favored stockpiling because of the "emergency," even though the prospects of doing business with the government at this time appeared to be remote.

Statistics of the industry tell the story of what has taken place in recent months. The figures on production, shipments, and stocks of slab zinc, compiled by the American Zinc Institute, in tons, follow:

	Production	Total Shipments	Stock at End
Jan.	83,205	78,403	26,703
Feb.	77,296	77,448	26,551
March	85,028	85,575	26,004
April	83,011	85,592	23,423
May	83,797	74,076	33,144
June	77,463	47,265	63,342
July	76,930	43,353	96,919

Stocks of slab zinc on hand as July ended, by grades: Special High, 33,401 tons; Regular High, 16,510 tons; Intermediate, 1,934 tons; Prime Western, etc., 45,074 tons.

On Aug. 6, a custom smelter cut the price 1½¢ to 13½¢ a lb. The drop was severe and caused quite a bit of commotion, particularly at high cost mining properties. The drop must have disturbed the authorities in Washington because smelters who took part in the pricing developments unexpectedly were informed that purchases for the stockpile would be resumed on the 13½¢ basis. As soon as this news got out, the demand for zinc began to improve and the price gradually moved up to 14¢. Our quotations on Prime Western for Aug. 11, 12 and 13 are weighted averages of sales reported to *E&MJ* by producers. Beginning with Aug. 14, the quotation was easily maintained at the 14¢ level.

Stockpile purchases of zinc by the Government were not large, probably totaling less than 5,000 tons. However, the move did serve to stabilize the market. Offerings of zinc by producers situated outside of this country have been increasing, and foreign concentrates also have been pressing on the market. Prime Western zinc has been selling abroad at prices ranging from 12¢ to 13¢ per lb.

Mine production of recoverable zinc in the United States in June was estimated by the Bureau of Mines at 58,817 tons, against 63,017 tons in May and a monthly average of 56,592 tons for last year. The decline in zinc prices from the high of 19½¢ was a factor in reducing mine output.

The Joplin, Mo., market for zinc concentrates has declined from $135 per ton to $92.50 over the last three months.

Copper Supply Improves

Consumers have been absorbing substantial tonnages of copper under the NPA's program of allocating domestic metal and granting entitlements for the foreign product. Allocations call for distribution of 141,000 tons of copper in September, against 139,252 tons in August. The September total, which includes metal for use in foundries, miscellaneous products and some export business, consists of 76,200 tons obtained from domestic sources and 64,800 tons of foreign origin metal.

The feeling persists that fabricators in this country have been buying freely to replenish their inventories, as well as protect themselves against possible work stoppages at mines and smelters.

Except for the heavy U. S. demands on the copper industry, the price outlook for foreign metal would be most uncertain. Producers situated outside of this hemisphere, with a few exceptions, have been selling their output at lower prices than those established by the Chilean authorities. Chile's production continued to move on the basis of 35½¢, f.o.b. Chilean ports. The British obtained copper from Africa and elsewhere on the basis of 33½¢, f.a.s. N. Y. Katanga also sold at the lower level.

Lead enjoyed an orderly market, thanks to an improved demand from consumers and some support in the nature of purchases for the 30,000-ton "buffer" stockpile. As August ended, it was estimated that the special stockpile contained at least 25,000 tons of lead. There was no talk of raising the price above 16¢.

Imports of refined lead in June totaled 60,746 tons, which compares with

Average Prices for August (E&MJ Quotations)

Copper:	
Electrolytic, domestic, refinery	24.200
Electrolytic, export, refinery	34.904
Lead:	
Common, New York	16.000
Common, St. Louis	15.800
Silver and Sterling Exchange:	
Silver, New York, per oz.	83.250
Silver, London, pence per oz.	73.000
Sterling Exchange, "Checks"	278.830
Zinc:	
Prime Western, East St. Louis	14.061
Tin:	
New York Straits	121.500
New York, 99% min.	(e)120.500
Gold, per oz. U.S. price	$35.000
Quicksilver, per flask	$187.000
Antimony (E&MJ) (d)	42.470
Antimony, bulk, Laredo	39.000
Antimony, in cases, Laredo	39.500
Platinum, refined, per oz.	90.000
Cadmium (a)	200.000
Cadmium (b)	207.500
Cadmium (c)	215.000
Aluminum, 99% plus, ingot	19.923
Magnesium, ingot	24.500
Nickel (f)	56.500

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lbs.

(a) Cadmium average based on the producers' quotation.

(b) Cadmium average based on the average of the producers' and platers' quotation.

(c) Cadmium average based on platers' quotation.

(d) Domestic, 5 tons or more but less than carload lot, packed in cases, f.o.b. New York.

(e) Tin content.

(f) F.o.b. Port Colborne, U.S. duty included.

63,405 tons in May and 9,265 tons in July last year. Reimposition of the duty and reduced foreign buying accounted for the sharp upturn in movement of lead into this country.

OPS allowed producers to raise the ceiling price of aluminum 1¢ a lb., which establishes the price of ingot at 20¢ and pigs at 19¢. Primary producers had asked for a rise of 2¢ or more. Production of aluminum will increase sufficiently over the remainder of the year to bring about an easier supply situation in the metal.

Though tin for forward delivery was available at concessions, the prompt quotation remained unchanged.

(*Markets continued on page 128*)

"Free" Gold Market

The free gold markets were generally active throughout August, but the trend in prices was irregular and there were no important changes, compared with prices named a month previous. West and Central Europe continued buying on unsettlement in currencies. Communist China has been a buyer. "Pick's World Currency Report" quotes, per fine ounce, as follows:

	COINS		BARS (12.5 kg.)	
	July 31	Aug. 30	July 31	Aug. 30
NEW YORK, transit	.....	.....	$37.75	$37.60
MANILA	$48.75	$48.00	38.50	36.75
HONG KONG	47.75	47.75	40.40	40.65
BOMBAY	49.75	50.00	45.00	46.00
TANGIER	51.00	51.25	37.75	37.75
BEYROUTH	50.20	50.80	37.85	37.80
PARIS	53.50	52.25	39.35	39.10
BUENOS AIRES	46.00	46.50	41.00	41.25

(*Markets continued on page 128*)

Major Metals

U. S. DAILY AND AVERAGE PRICES

Aug. 1952	Electrolytic Copper (a) Domestic	(b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc East St. Louis	Aug. 1952	Sterling Exchange "Checks"	Silver (c) New York	Silver London	Gold London	Gold (d) United States
1	24.200	35.025	121.500	16.000	15.800	15.000	1	279.2500	83.250	73.000d.	248s.	$35.00
2	No Market	34.800	121.500	16.000	15.800	15.000	2	(e)	(e)	(e)	(e)	35.00
4	24.200	34.700	121.500	16.000	15.800	15.000	4	279.2500	83.250	Holiday	Holiday	35.00
5	24.200	34.525	121.500	16.000	15.800	15.000	5	279.5000	83.250	73.000d.	248s.	35.00
6	24.200	34.800	121.500	16.000	15.800	13.500	6	279.0000	83.250	73.000d.	248s.	35.00
7	24.200	34.875	121.500	16.000	15.800	13.500	7	279.3750	83.250	73.000d.	248s.	35.00
8	24.200	34.975	121.500	16.000	15.800	13.500	8	279.6875	83.250	73.000d.	248s.	35.00
9	No Market	34.300	121.500	16.000	15.800	13.500	9	(e)	(e)	(e)	(e)	35.00
11	24.200	34.975	121.500	16.000	15.800	13.640	11	279.6250	83.250	73.000d.	248s.	35.00
12	24.200	34.850	121.500	16.000	15.800	13.960	12	279.5000	83.250	73.000d.	248s.	35.00
13	24.200	34.925	121.500	16.000	15.800	13.980	13	279.2500	83.250	73.000d.	248s.	35.00
14	24.200	35.075	121.500	16.000	15.800	14.000	14	278.5000	83.250	73.000d.	248s.	35.00
15	24.200	35.225	121.500	16.000	15.800	14.000	15	278.5000	83.250	73.000d.	248s.	35.00
16	No Market	34.300	121.500	16.000	15.800	14.000	16	(e)	(e)	(e)	(e)	35.00
18	24.200	35.025	121.500	16.000	15.800	14.000	18	278.5000	83.250	73.000d.	248s.	35.00
19	24.200	35.350	121.500	16.000	15.800	14.000	19	278.5000	83.250	73.000d.	248s.	35.00
20	24.200	35.175	121.500	16.000	15.800	14.000	20	278.5000	83.250	73.000d.	248s.	35.00
21	24.200	35.225	121.500	16.000	15.800	14.000	21	278.6250	83.250	73.000d.	248s.	35.00
22	24.200	35.250	121.500	16.000	15.800	14.000	22	278.3750	83.250	73.000d.	248s.	35.00
23	No Market	34.550	121.500	16.000	15.800	14.000	23	(e)	(e)	(e)	(e)	35.00
25	24.200	35.075	121.500	16.000	15.800	14.000	25	278.3750	83.250	73.000d.	248s.	35.00
26	24.200	34.675	121.500	16.000	15.800	14.000	26	278.3750	83.250	73.000d.	248s.	35.00
27	24.200	35.325	121.500	16.000	15.800	14.000	27	278.3750	83.250	73.000d.	248s.	35.00
28	24.200	34.900	121.500	16.000	15.800	14.000	28	278.2500	83.250	73.000d.	248s.	35.00
29	24.200	34.925	121.500	16.000	15.800	14.000	29	278.1250	83.250	73.000d.	248s.	35.00
30	No Market	34.675	121.500	16.000	15.800	14.000	30	(e)	(e)	(e)	(e)	35.00
	AVERAGES FOR MONTH								**AVERAGES FOR MONTH**			
Aug.	24.200	34.904	121.500	16.000	15.800	14.061	Aug.	278.830	83.250	73.000	—	35.00
	AVERAGES FOR WEEK								**AVERAGES FOR WEEK**			
Aug.							Aug.					
6	24.200	34.808	121.500	16.000	15.800	14.750	6	279.250	83.250	—	—	—
13	24.200	34.817	121.500	16.000	15.800	13.680	13	279.488	83.250	—	—	—
20	24.200	35.025	121.500	16.000	15.800	14.000	20	278.500	83.250	—	—	—
27	24.200	35.017	121.500	16.000	15.800	14.000	27	278.425	83.250	—	—	—
	CALENDAR WEEK AVERAGES											
Aug.												
2	24.200	35.096	121.500	16.000	15.800	15.000						
9	24.200	34.696	121.500	16.000	15.800	14.000						
16	24.200	34.892	121.500	16.000	15.800	13.930						
23	24.200	35.096	121.500	16.000	15.800	14.000						
30	24.200	34.929	121.500	16.000	15.800	14.000						

Calendar week averages, New York silver: Aug. 2nd, 83.250; 9th, 83.250; 16th, 83.250; 23rd, 83.250; 30th, 83.250.

(e) No market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c. per pound, the average differential for delivery charges.

(b) Our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c. for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingotbars; cathodes are sold at a discount of 0.125c. to 0.15c. per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West, effective Jan. 1, 1951, commanded a premium of 1.35c. per pound over the current market for Prime Western; Special High Grade 1.50c.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 points.

(c) The daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and fractions of a cent per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, as reported daily by regular suppliers, and is usually one-quarter cent below the price paid for such bar silver, this deduction being the allowance to such suppliers for carrying, delivering and marketing. In addition to foreign silver, the quotations also apply to domestic silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver is 90.5c. per troy ounce 1000 fine, effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

Behind the By-Lines . . .

G. P. Lutjen

Any mining man that likes a healthy argument has plenty of opportunities to indulge his whim with the Paley Report floating around. In this issue we've stacked the ammunition on pages 90 to 95. There you'll find the salient facts plus opinions from outstanding figures in the industry. These opinions range from citing the report as the greatest piece of prose this side of Ernest Hemingway to the conviction that the men responsible for the report should be housed in rooms with soft walls and bars to keep the draft out. What's your opinion?

This feather should be red, of course, because the fall is Red Feather time: a time when all of us should close our eyes to taxes and the high cost of living long enough to reach into our pockets and shell out a buck or two. This money does a lot of good for those less fortunate than we, not only the needy of our own communities, but a lot of people who will be spending the season in Korea or some other undesirable place. Enough said. Give to your Community Fund Drive if you can. You know what and whom it's for.

That recent $94 million loan to Magma Copper Co. seems to have had quite an impact on the industry. Not only did the deal become a leading conversational piece, but it actually penetrated the subconscious mind of more than one mining man. We know whereof we speak. One of our scouts reported entering a tavern with a prominent mining executive who casually asked the bartender to "mix up a couple of very dry Magmas."

But the clincher appeared in a New York metal paper. Reporting on the appointment of Lawrence Litchfield as president of Alcoa, it stated, "After taking post-graduate studies at Harvard University, he was graduated Magma cum laude."

Well, it's been a long, hot summer and we've all been working hard.

We got our come-uppance this month for sure. Remember that South African news item we mentioned in June, about the two mine officials who dived into the flooding Freddies South No. 2 shaft? Well, our playing fast and loose with the script has not been without its repercussions. There's this letter from Mr. J. B. Lowe of Derbyshire, England, for example.

"I was most amused by your account of the saving of Freddies South No. 2 shaft, but you surely cannot suppose that an Englishman would allow a small matter such as a flooding shaft to interrupt his bridge. Gad, sir, not a gentleman, obviously. What probably happened was that the officials finished their bridge and bottle of port, stoked up the fire with a few natives that happened to be handy, and sauntered over to the shaft, pausing only to arrange a two ball foursome with old Cholmondeley (used to be in the 43rd Regiment of Foot and Mouth, don't y'know). On reaching the shaft, they were probably pushed in by an American journalist."

In the publishing business, when readers don't renew their subscriptions, that's bad. Usually editors don't like to talk about it. But this month we received a letter from Durban, Natal, in which Mr. G. A. Denny informs us that he will not renew his subscription, and we don't mind you reading it at all.

". . . I regret to say that I will not renew my sub, because of my age (over 84) and failing eyesight, which makes the reading of small print impossible.

"I have had long innings, with some breaks, with you, covering perhaps over a half century, and throughout my long term as a reader (and sometimes as a contributor), I have found your journal most informative and helpful.

"My son, Denison Denny Jr., M. Sc., who lives in Toronto, is, I know, a subscriber . . . and will therefore keep the name on your records.

"With my best wishes for continuance of your splendid publication, for the benefit and guidance of my followers in the profession, I am,

Yours faithfully,"

The lady on the right is our Miss Ryan. The edifice she is so gingerly supporting is a stack of some 12,000 reply cards that E&MJ has received in the past two years, requesting more information about new products featured in the E&MJ New Products Digest. If these cards were laid end to end (a traditional supposition in cases like this), they would stretch from the E&MJ office to the Eldorado Pawn Shop on Eighth Avenue, or any other distance that measures 5,183 ft. and 7½ in.

For regular clients of the NPD, Miss Ryan is the one who sees to it that the manufacturers hear about your desire for information. In the past two years she has handled nearly 60,000 requests. Her only complaint is that each month there are about a half dozen cards that come in without a name or address. Being soft-hearted, she pictures these absent-minded people in remote mining camps waiting for the mail that never will come.

Female of the Species Dept. Some girls really have the members of their own sex pegged. Take this comment we overheard on the elevator yesterday: "I wouldn't say she thinks of men all the time, but when she thinks, she thinks of men."

ENGINEERING AND MINING JOURNAL
SEPTEMBER, 1952

There'll Be Some Changes Made

THIS IS THE MONTH when the American Mining Congress meets once more, argues the merits of various points of view, and passes a set of resolutions that will express, as well as anything can, the majority opinion of the mining industry.

The resolutions probably won't differ much from those passed two years ago at the equivalent meeting of the AMC in Salt Lake City, although they will stand in marked contrast to those of say 20 years ago. Don't let the surface similarity fool you. The industry that presents them is not the same as the industry of two years ago. In technology, character of management, breadth of interests, and economic climate, changes are taking place that are going to stir the industry to its roots over the next few years. Let's consider them in the four groups mentioned.

Changing technology puts the mining industry for the first time into a rank near that of the chemical industry for opportunities for rapid advancement. The expanding chemical industry has been forcing young men up the ladder rapidly. It is happening in mining, too. A young fellow called up the other day to tell us he was leaving to run a new metallurgical plant being set up out in the Midwest. A new process created the opportunity for him.

New processes are opening new jobs and new opportunities right and left. That's only part of the story, however. In every branch of mining, there are new opportunities for young men trained in the modern and, to us, incredible techniques of science today.

This, in part at least, accounts for a gradual shift in **the character of mining management.** When our editors travel through mining districts today, more and more frequently they meet men in their thirties and forties as superintendents and managers.

These new managers don't try to substitute a shout and a hard fist for cool thought and a wise, firm decision. They study management as a technique; they are receptive to new ideas. Given sound assistance from top management, where long experience counts, this younger management group is going to give mining a shot in the arm.

The growing breadth of interest, as more mining companies enter the petroleum field, will teach mining that young ideas can pay off, as they have in the petroleum industry. There may be gray beards (if they let them grow) among the Standard Oil of New Jersey management, but there's no gray-beard thinking there.

The one outstanding example of how the oil people have far eclipsed the mining industry performance is in exploration. We know some individuals in mining who have done excellent jobs in finding new orebodies or in cutting exploration costs, but we know of no effort, or even attempt at an effort, to achieve industry-wide cooperation on research to develop exploration methods to locate blind, deep-seated orebodies. Such methods as we do have were invented or developed largely by or for the oil companies.

There are glimmerings of serious thought on this point in several quarters in the industry, and a longer contact with the fast-working methods of the petroleum people should bring them into focus. Of course, the Paley Report, summarized in this issue, is quite specific on this point.

The Paley Commission's report sketches pretty clearly the economic shape of things to come, if we want it that way. On this matter of exploration, the report suggests that government take the initiative in financing research to improve existing geophysical methods and develop new ones. The work would be done in university or government laboratories. There didn't seem to be much thought given to industry laboratories.

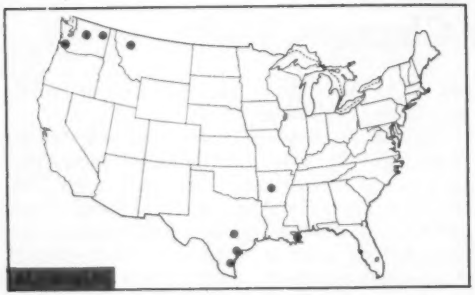
Other parts of the Paley Report are even more significant. There are going to have to be changes made in the methods of locating and holding claims. The old ways are running into situations they can't handle; geophysical prospecting, for example.

What is true of the land laws is true of many more of the customs and attitudes the mining industry has held for years. We don't, for a minute, hold that the Paley Report is a complete blueprint for action. We dislike some of its proposals intensely. We do wish to point out, however, that the Paley Report gives you an excellent idea of the way the trend of the times is headed. Also, it gives it to you in time for you to do something about it, if you want to.

Therefore, entirely apart from certain changes we hope will be brought about by a time-honored expression of public opinion of early next November, we look forward to a livelier and more exciting period than mining has known in years. As that old blues song put it, "There'll Be Some Changes Made!"—and about time, too!

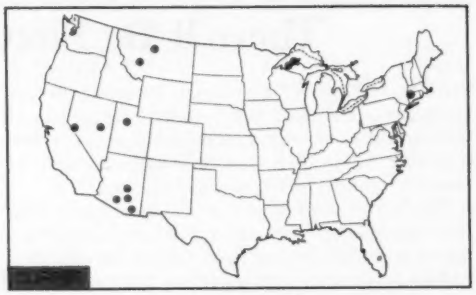
U. S. Mining Today . . .

Look carefully over this simple listing of new mining projects



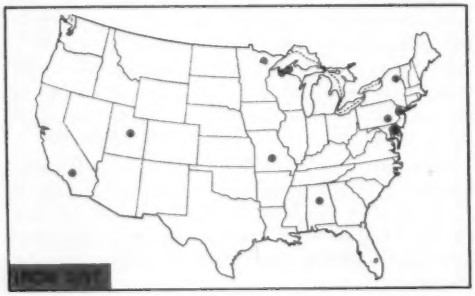
Leading the nonferrous metals in both size of investment and tonnage increase, the U. S. aluminum industry will double its 1950 production capacity by 1955.

NEW PROJECTS	INVESTMENT
Aluminum Co. of America, Point Comfort, Tex.	$35,000,000
Aluminum Co. of America, Wenatchee, Wash.	85,000,000
Aluminum Co. of America, Rockdale, Tex.	85,000,000
Kaiser Aluminum Co., Chalmette, La.	200,000,000
Kaiser Aluminum Co., Mead, Wash.	20,000,000
Reynolds Metals Co., Corpus Christi, Tex.	83,000,000
Reynolds Metals Co., Longview, Wash.	18,500,000
Reynolds Metals Co., Little Rock, Ark.	55,000,000
Anaconda Copper Mining Co., Kalispell, Mont.	45,000,000
Total investment	**$626,500,000**



Never in history have so many large-scale copper mining projects been launched in so short a time. Manning and staffing them will be the chief problem.

NEW PROJECTS	INVESTMENT
Anaconda Copper Mining Co., Butte, Mont.	$27,000,000
Anaconda Copper Mining Co., Yerington, Nev.	38,000,000
Anaconda Copper Mining Co., Refinery expansion	5,500,000
Anaconda Copper Mining Co., Brass mills & misc.	40,500,000
Phelps Dodge Corp., Bisbee, Ariz.	25,000,000
Miami Copper Co., Copper Cities, Ariz.	15,000,000
Copper Range Co., White Pine, Mich.	57,000,000
American Smelting & Refining Co., Silver Bell, Ariz.	17,000,000
Kennecott Copper Corp., Deep Ruth Project, Nev.	14,000,000
San Manuel Copper Co., Oracle, Ariz.	111,000,000
Calumet & Hecla Cons. Copper Co., Osceola Mine, Mich.	6,000,000
Total investment	**$356,000,000**

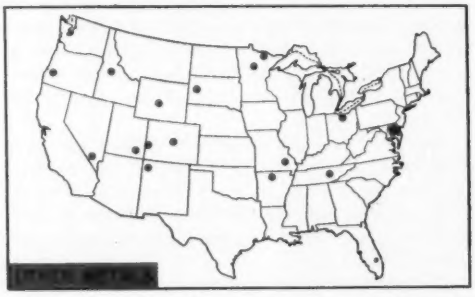


Ever-increasing demand for steel calls for tremendous expansion in iron ore output. These are all iron mining projects, other than taconite.

NEW PROJECTS

Armco, Tex.
Bethlehem Cuba Iron Mines, Pa.
Balkan Mining Co., Minn.
Bennett Mining Co., Minn.
Butler Bros., Minn.
Cleveland Cliffs Iron Co., Minn.
Cleveland Cliffs Iron Co., Mich.
Columbia Iron Min. Co., Utah
Coons Pacific Co., Minn.
Cuyuna Ore Co., Minn.
Douglas Min. Co., Minn.
Hanna Iron Ore Co., Minn.
Hanna Iron Ore Co., Mich.
Hoyt Mining Co., Minn.
Inland Steel Co., Mich.
Interstate Iron Co., Minn.
Jones & Laughlin Ore Co., N. Y.
Kaiser Steel Co., Calif.
Lake Mining Co., Minn.
Mahoning Ore & Steel Co., Minn.
Mesaba Cliffs Iron Min. Co., Minn.
Morton Mining Co., Minn.
Negaunee Mining Co., Mich.
National Lead Co., N. Y.
Odanah Iron Co., Wis.
Oliver Iron Min. Co., Mich.-Minn.
Ozark Ore Co., Mo
Puritan Min. Co., Mich.
Pyrites Co., Inc., Del.
Republic Steel Corp., N. Y., Ala., and Minn.
St. James Min. Co., Minn.
Shook & Fletcher, Ala.
Sloss-Sheffield Steel & Iron, Ala.
Snyder Min. Co., Minn.
Tenn. Coal, Iron & RR Co., Ala.
Utica Mining Co., Minn.
Verona Mining Co., Mich.
Alan Wood Steel Co., Pa.
Warren Pipe & Foundry Co., N. J.
Woodward Iron Co., Ala.
Youngstown Mines Corp., Mich.

Total investment $261,500,000

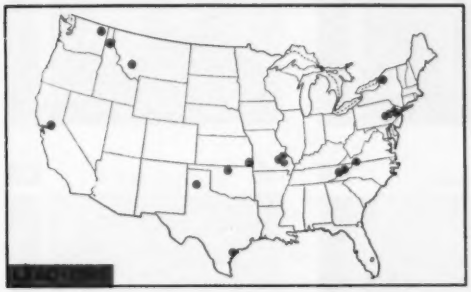


New emphasis on alloys, plus increased demand for metals like titanium, put the spotlight on so-called minor metals. These are only a few of the new projects in operation or planned.

NEW PROJECTS	INVESTMENT
Manganese	
New mines or plants opening in Tenn., Ark., Nevada, Minn., and Ohio	$15,000,000
Cobalt	
National Lead Co., Fredericktown, Md.	5,000,000
Howe Sound Co., Cobalt, Idaho	8,500,000
Molybdenum	
Climax Molybdenum Co., Climax, Colo.	10,000,000
Titanium	
National Lead Co., Las Vegas, Nev.	14,000,000
E. I. DuPont de Nemours & Co., Wilmington, Del.	15,000,000
Uranium	
Several projects in the Colorado Plateau area, Wyoming and South Dakota	14,000,000
Nickel	
International Nickel Co., Ely, Minn.	
M. A. Hanna Co., Riddle, Ore.	
Total investment	**$81,500,000**

A $2-Billion Expansion

now under way. This is a period of growth without parallel.



New discoveries in Tennessee and new mines in the East and the Northwest bring in production to replace declining output of older districts. Smelters are expanded.

NEW PROJECTS	
American Smelting & Refining Co.	
Corpus Christi, Tex.	
Selby, Calif.	
Van Stone Mine, Wash.	
Amarillo, Tex.	
Newark, N. J.	
St. Joseph Lead Co.	
Balmat, N. Y.	
Indian Creek, Mo.	
Herculaneum, Mo.	
Haydon Creek, Mo.	
New Jersey Zinc Co.	
Austinville, Va.	
Friedensville, Pa.	
Palmerton, Pa.	
Ogdensburg, N. J.	
Blackwell Zinc Co., Blackwell, Okla.	
Universal Exploration Co., Jefferson City, Tenn.	
Bunker Hill & Sullivan M. & C. Co., Kellogg, Idaho	
American Zinc Co., of Tenn., North Friends Sta., Tenn.	
Eagle Picher Co., Galena, Kans.	
Anaconda Copper Mining Co., Butte, Mont.	

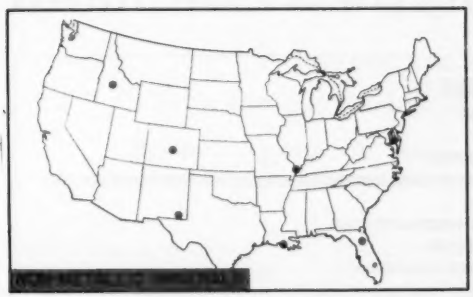
Total investment $79,000,000

The largest investments in any single mining industry enterprise will be made in taconite mining and milling. When completed, the Erie plant mentioned below will be the largest in the metal mining field.

NEW PROJECTS	INVESTMENT
Erie Mining Co., Aurora, Minn.	$298,000,000
Scheduled first production — 1956	
Probable full production — 196?	
Final capacity, tons ore/day — 88,000	
Final capacity, tons conc./yr. — 10,500,000	
Reserve Mining Co., Beaver Bay, Minn.	(approx.)*$300,000,000
Scheduled first production — 1955	
Probable full production — 196?	
Final capacity, tons ore/day — 83,000	
Final capacity, tons conc./yr. — 10,500,000	

* Estimate of probable cost of completed plant. No figure released by Reserve as yet.

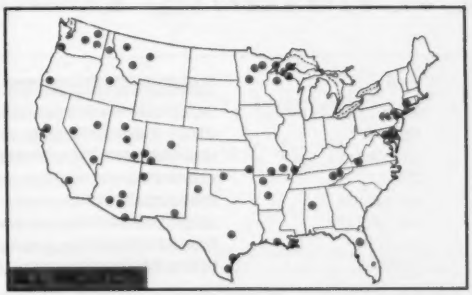
Total investment $598,000,000



So widespread in the range and complexity of its operation, expansion in metallic mineral industry can only be approximated. These are only some of the larger projects now under way.

NEW PROJECTS	INVESTMENT
Sulphur — Several new or expanded properties in the Gulf Coast area and elsewhere	$25,000,000
Potash — New mines and expansion in Carlsbad, N. M. district	28,000,000
Phosphate — New properties and expansion in the Florida field	25,000,000
Fluorspar — New properties or expansion in Ill., Colo., Del.	5,000,000

Total investment $83,000,000

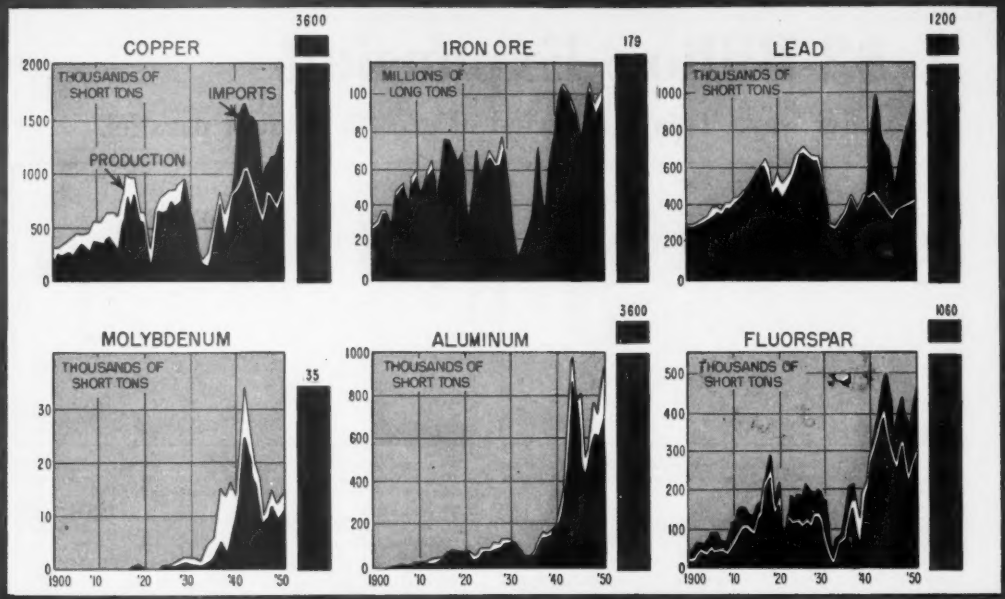


Each section of the country has a part in this tremendous growth of the mining industry. Not in the lifetime of any of us are we likely to see again so great an expansion of productive capacity in so short a time. Remember, too, that these are only the highlights of mining's expansion program. There are hundreds of smaller-scale projects in every segment of the industry, the combined output of which is of real significance in helping to swell production figures.

NEW PROJECTS	INVESTMENT
Aluminum	$626,500,000
Copper	356,000,000
Lead-Zinc	79,000,000
Taconite	598,000,000
Iron Ore	261,500,000
Other Metals	81,500,000
Nonmetallic Minerals	83,000,000

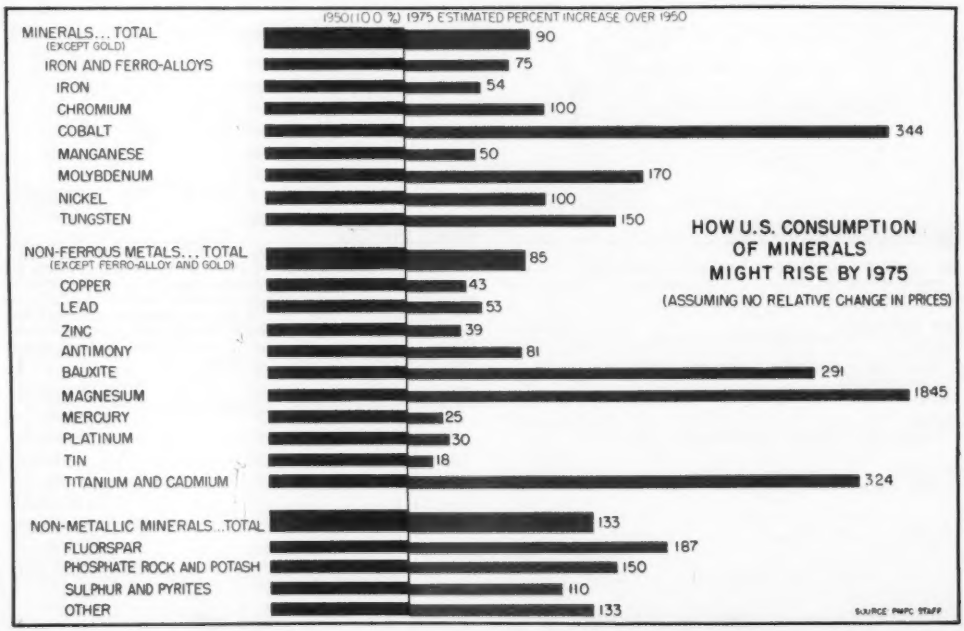
Total investment $2,085,500,000

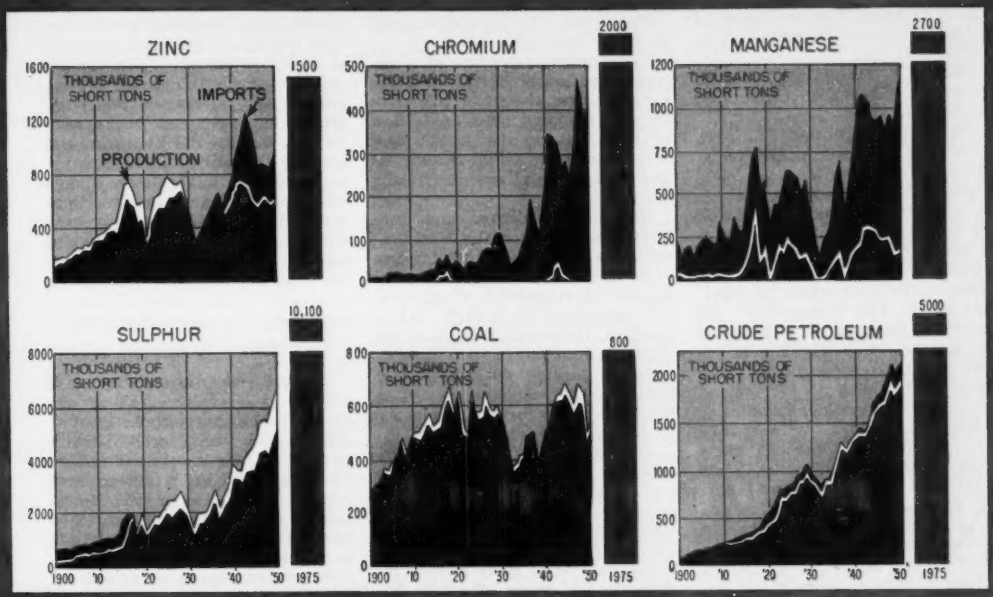
For an estimate of the future, turn the page ➡



THESE CHARTS show past United States production and consumption of raw materials and give estimates of the future, based on needs of growing U. S. population. The white areas, or lines show production; black areas show

U. S. Mining Tomorrow... Demand





consumption. Where black extends beyond white lines, U. S. is importing that much. Red bars show projected U. S. demands in 1975. The figures over red bars give quantity estimates. See article for technique used.

for Minerals Up 90% by 1975

That's the conclusion of the Paley Report, briefed below. Agree or not, you'll be interested in it.

YOU DON'T HAVE TO READ the five volumes (813 pages) of the report of the President's Materials Policy Commission, the Paley Report, in order to find out what it is about. That's the purpose of this article, to summarize briefly: who prepared the report, how it was written, what its forecasts are, and what suggestions it makes with regard to the mineral industry.

This summary makes no attempt to approve or disapprove any part of the report. You will find the comments of several mining men on the following pages. Our own opinion was expressed editorially in the August issue.

The Paley Report will be discussed or quoted or condemned at mining meetings for years to come. We offer this summary as background for your own part in these discussions or for any further study you may care to make.

1. Why the Report Was Made

Statistics show that demand for the raw materials of the world is tending to outrun available supplies. That means trouble, all the way from economic hardships to outright war, as the nations of the world struggle to get the material they need.

The Paley Commission, most of its members good Republicans, was set up by President Truman to study the long-range needs of the United States so that some kind of intelligent planning could be done to keep enough raw materials coming to U. S. industry, but to avoid the world-wide upsets that an uncontrolled rush to buy materials could cause.

The commission was directed to aim its investigation at the decade 1970-1980, or for convenience sake, the year 1975.

2. Who Made the Study?

These are the commission's members:

Chairman: William S. Paley, chairman of the board, Columbia Broadcasting System, New York, N. Y.

Arthur H. Bunker, president, Climax Molybdenum Co., New York.

George R. Brown, executive vice president, Brown & Root (engineers), Houston, Tex.

(Please turn to page 92)

Eric Hodgins, member board of editors, Fortune Magazine, New York, N. Y.

Edward S. Mason, professor of economics, Harvard University, Cambridge, Mass.

These men appointed Philip H. Coombs, of the Ford Foundation, as director of the work of the commission. As he began developing an organization, the commission got various experts in their fields to make reports, or preliminary studies to guide later work. For example, the commission (abbreviated as the PMPC hereafter) got Professor Raymond F. Mikesell of the University of Virginia to report on foreign resources, and Alan M. Bateman to recommend the course of geological studies.

Most of the full or part-time staff of over 200 persons came from government agencies. Some came from colleges or from industry. In addition, the PMPC called in as consultants, or for frequent conferences, a great many men from the raw materials industries.

Special studies were made for the PMPC by such organizations as: Battelle Institute, the Koppers Co., Standard Oil Development Co., the National Research Council, Arthur D. Little Co., American Standards Association, the USGS, the USBM, and many others.

A detailed questionnaire went to 275 mining companies and the response that resulted was extraordinarily high.

A mountain of information was collected and boiled down into the report. The volume on technology is particularly good in this respect. Unpublished material was turned over to the NSRB.

3. What the Report Is Based On

The report's basic idea is that the U. S. standard of living is threatened by a gradual rise in the cost of producing raw materials. By "cost" the PMPC doesn't mean just dollar cost, but real cost, which is the hours of labor and amount of capital needed to put a pound of copper, let's say, into useful form.

Until recently, there was no doubt but that real costs were declining. Now, the PMPC believes real costs are declining less rapidly and for some materials, may even be rising. If real costs of materials rise seriously, it means a corresponding rise in the prices we pay for nearly everything we buy, and a drop in our standard of living.

Here's the PMPC's statement of its major premise:

"The overall objective of a national materials policy for the United States should be to insure an adequate and dependable flow of materials at the lowest cost consistent with national security and with the welfare of friendly nations."

Reading the report, one finds strong emphasis on the least-cost principle as meaning that imports of metals should be encouraged, as against development of mineral self-sufficiency, at a high cost in the U. S. The report recognizes the strategic problem in such dependence on foreign sources, but it puts the chief emphasis on cost as the criterion in foreign vs. domestic mining of a commodity.

The PMPC's attitude on government in business is that private enterprise is the best means of securing and maintaining a high standard of living, but that there are many things government can and should do to make private industry's job more effective. Financing research on means of exploring for blind orebodies is one example of a needed job that industry can't, or won't, do on a risk basis. The report outlines others.

4. How the Report's Estimates Were Made

The basis of the report's projections of demand for minerals in 1975 (as pictured in the charts at the head of this article) is an estimate of the working force, the population, and the gross national product of the U. S. in 1975. Briefly, this is how they arrived at it.

The working force, by which is meant everyone able and willing to hold a job, has always come to 56% of the number of people over 14 years of age. Because most of the people who will be in that group by 1975 are already born, the Bureau of the Census estimates that there'll be 146-million people 14 years old or over by 1975. This means a labor force of about 81.7-million.

Assuming full employment (with about 3% unemployed), and assuming that the productivity of labor increases about as it has in the past, this working force can produce about twice as much in 1975 as is produced now.

The population will have grown by then to about 193-million people, according to the estimate of the U.S. Census Bureau, and it should absorb this doubled production.

Based on the probable demands of this increased population in terms of such things as houses, automobiles, airplanes, television sets, other appliances, books, telephones, etc., the PMPC has worked back to the probable demand for each metal or mineral. They have tried to be conservative, and they've recognized trends in technology, both in production and use, and in substitution of one material for another.

5. What Report's Estimates Mean to Mining

The projected demands for 1975, arrived at as explained above, are shown in the charts at the head of this article. The overall demand in the U. S. for metals and minerals is expected to be 90% greater in 1975 than it was in 1950. You'll have to judge for yourself whether or not 1950 was a good year to use as a comparison.

There isn't space to detail the PMPC's analysis of each metal or mineral, but the percentage increases seen for each one are shown. Accuracy of the PMPC's estimates for supply, or demand, of some materials, lead and sulphur for example, is questioned severely by some industry members. The PMPC has been careful to point out that these data are not offered as absolute predictions, merely educated guesses.

6. What the Report Proposes for Mining

On taxation, that domestic corporations with foreign subsidiaries get certain tax benefits; that present limitations on expensing of exploration costs be removed; that percentage depletion be retained at present rates, but that easily-found materials, recently added to the eligible list, be removed.

On mining claims, that prospectors should have a choice of leasing, as well as patenting, mineral lands; that only tracts on which exploration leases or permits are granted be closed to general prospecting; that tracts leased should be recorded; that tracts be leased large enough to permit geophysical prospecting.

Also, that all non-patented, as well as patented, claims be recorded; that future claims be limited to mineral deposits only, with no other surface rights or extralateral rights granted; that annual

improvement requirements be raised to $250 for unpatented, and $1250 for patented, claims; that the Interior Department be given certain new powers to invalidate claims; that a claim not put up for patent in 10 years become invalid automatically.

On aid to small mines, that a system of financial aid to small mining be established, run by the USBM, to advance up to $100,000 to support exploration or development of "minerals of strategic importance for which domestic reserves are inadequate." Applicant for such aid to supply at least 25% of total funds used; total advances to be limited to about $15-million over any five-year period.

On stockpiling, that stockpiling of strategic and critical materials be a permanent part of U. S. policy, with enough funds provided for orderly purchases at all times; that vulnerability to attack of all Western Hemisphere sources be evaluated in setting stockpile goals; that study be made of any better means than stockpiling to promote national security; that stockpiling be done at minimum cost without favoring any producer or group; that "Buy American" clauses in present stockpile act be eliminated; that nothing be taken out of the stockpile except during declared emergencies when national security clearly requires it.

On fact gathering, that each agency of the government concerned with primary data on materials strengthen its own fact-gathering, analytical, and programming machinery as related to mining; that the NSRB act as central collecting and reporting agency for all these facts and programs; that special attention be given the problems of small mines; that the mining industry, through the AIME, collect data on ore reserves, cost of exploration, rates, trends and prospects of discovery, all this to be turned over to the government; that the United Nations keep mineral statistics on a world-wide basis and set up study groups as needed.

Also, that a complete census of mineral industries be taken in 1954 and every five years thereafter; that the USGS expand its mapping program 100% as fast as possible; that a coordinated national system of libraries of drill samples, cores, and data be set up by the USGS and the USBM; that intensive research be done on new ways of finding deeply-buried orebodies, this to be run by a committee from government, industry, and universities; that direct exploration by government be limited to those situations where risk is so great, private industry can't afford to take it.

On the St. Lawrence Seaway, that the transportation end of it be started at once, for security reasons.

On aid to foreign mining, that our government should deal with foreign governments to get better treatment for U. S. investors abroad; that technical assistance programs abroad be stepped up to about $4-million in aid yearly; that the work of the DMPA abroad be made permanent and that it be allowed to make up to 10-year contracts for foreign-produced minerals, with price floors as needed; that foreign mineral production be financed by special funds outside loans from Export-Import Bank, that such loans be limited to 50% of total investment required.

On tariffs, that a law be passed, apart from the Reciprocal Trade Agreements Act, permitting the wiping out of the U. S. tariff on any industrial material when the U. S. is, or is expected to become, "substantially dependent on imports" of it. For example, that could cut out the tariff on lead right now.

On market stability, that serious consideration be given to building up international buffer stocks (ever-normal granaries) of metals, to be run by an international agency. The idea would be to buy in bad times, sell in good times, thus stabilize world prices of metals and thereby encourage new investment in mining. The PMPC believes private capital won't take the risk much longer of seeing its investments in mining endangered by a fluctuation in metal prices.

This is probably the most controversial issue raised by the PMPC's report.

The editors have available a listing of these proposals, together with the PMPC's analysis of the outlook for specific minerals or metals. To obtain a copy, simply address your request to: The Editor, Engineering and Mining Journal, 330 W. 42d St., New York 36, N. Y. For the complete report write to the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price is $6.25 for all five volumes, or $4.50 for Volumes I, II, and IV, in which you'll be most interested.

Here are the views of some mining men on the Paley Report:

"A discussion of alternative plans is essential."

ARTHUR H. BUNKER
Member of P.M.P. Commission
and President of
Climax Molybdenum Co.
New York, N. Y.

"Knowing quite well how subject to change any personal plans may be when made for more than a year or so ahead, each member of the President's Materials Policy Commission had full appreciation of the toughness of the assignment given him in trying to peer 25 years into the future.

"None of us welcomed the role of prophet, yet the task given us inevitably required a kind of prophecy. We have done our best with the assignment and we strongly feel that a discussion of alternative long-range plans is timely and essential.

"We do not offer this report as a detailed picture of the world of 1975. We never intended it to be, as we believe is very clear from the text itself; nor do we advance the projections and the proposals in the report as a sort of gospel to be embraced or rejected all of a piece.

"We do offer these suggestions for consideration as possible adjuncts to affect working of the profit motive system of economics in that world of 25 years hence, the outlines of which we have tried in general terms to trace. That is the system by which we all live and in which I need hardly say we all believe. That is the spirit in which the commission offers this report for study and debate. If it focuses at-

tention upon this materials problem, if it promotes widespread debate on the best methods of solution and reaps intelligent discussion rather than acrimony, it will have served a big purpose."

"Proposals will influence legislative action for a long time."

HORACE M. ALBRIGHT
President
United States Potash Co.
New York, N. Y.

"Looking at the report of the President's Materials Policy Commission solely from the standpoint of the mining industry, I think it contains a vast amount of valuable data on the mineral resources of our country and the world and presents pretty sound estimates of our mineral requirements for the next 25 years.

"The report is based on resource and production figures furnished by the mining industry itself. The estimates of metals and minerals needed in the foreseeable future had the expert analysis of able men who are thoroughly familiar with industrial and defense requirements.

"Some of the proposals made with reference to mining law revision and change in tariff and other foreign trade policies probably will be widely debated, and there will be disagreement as to whether they are practicable or in harmony with our private enterprise system. My own view at this time, with deeper study of the report still to be undertaken, is that a great job has been done and that the commission's data, opinions, estimates, and proposals will influence legislative and administrative action for a long time and for the general benefit of the nation's economy.

"In my judgment the commission is an exceptionally competent group of men in whom the mineral industry should have great confidence, even though there may be disagreement with some of the findings and some of the proposals advanced in the report."

Report has an *"objectivity unexpected considering its origin."*

HARRISON SCHMITT
Silver City,
N. M.

"The report is admirably organized and written, with an objectivity unexpected considering the origin of it. The critical theme, the now current dangerous gap between our production of many materials and our industrial needs in the face of possible enlargement of the war, is adequately dramatized. This, if given sufficient publicity, will perform an essential service.

"As might be anticipated where solutions are proposed, strong emphasis is put on federal direction and control. With the present threat to our security, councils of caution are on a defensive level"

"Tariff removal is not feasible or equitable . . ."

ANDREW FLETCHER
President
St. Joseph Lead Co.
New York, N. Y.

"The President's Materials Policy Commission has presented a vast amount of pertinent information about the mineral industries in an attractive and scholarly manner. I am in hearty agreement with many of its observations, especially those pertaining to mining taxation. However, certain fundamental conclusions and recommendations do not appear to be for the best interests of the public or the United States mining industry. For example:

"1. Tariff removal is not feasible or equitable so long as the domestic miners, with relatively low-grade ores and high labor rates, must purchase foodstuffs from a subsidized agriculture, and materials or equipment in a tariff-protected market. A prosperous mining industry is essential for our defense, and, as an incentive for production, a tariff is more desirable than a discriminatory government subsidy, such as the wartime Premium Price Plan. A sliding scale tariff would be preferable, in which the highest tariff protection would occur during depressed world market conditions and graduated downward as prices rose, until completely eliminated under abnormal international conditions.

"Incidentally, the commission's argument for the abolition of tariffs is based upon "a full employment situation," which cannot always be assured except in a socialized economy.

"2. It is difficult to reconcile the commission's endorsement of the free enterprise system, with their recommendation of such specific government control devices as:

'(a) the multilateral contract;

(b) international buffer stocks;

(c) international buffer stocks combined with limited quota arrangements.'

"The commission's recommendations appear to be variations of the ancient, ever-normal-granary philosophy, which has been proved unworkable and inadvisable from the Egyptian civilization down to the present. There is no reason to believe that governments which cannot stabilize their own affairs, or balance their budgets, can collectively stabilize metals and minerals sold in international trade. Both the House and Senate recently adopted provisions that reject the injurious controls established by the International Materials Conference. It is therefore disappointing that the commission should endorse the 'distribution of world supplies . . . and the stabilization of raw material prices.'

"3. I do not agree with the commission's forecast of a serious lead shortage with a commensurate high price, and the necessity of instituting conservation measures for this metal. The studies made by the St. Joseph Lead Co. do not substantiate the commission's conclusions. It would be most unfortunate if the domestic mining industry and its customers were persuaded to accept governmental controls because of the fear of a lead or other metal shortage created by the commission's predictions. There can be no shortage, if the law of supply and demand functions in a free market economy—untrammeled by government controls."

Free enterprise is essential if country's growth is to continue as projected.

ARTHUR NOTMAN
55 Liberty St.
New York, N. Y.

"On the basis of my previous examination of the specific drafts on copper, lead and zinc made by the commission's staff, which are substantially unchanged in the report, I feel that those topics were carefully and objectively considered.

"Any extrapolation for 23 years into the future as to demand, supply and price for even such fundamental raw materials for our civilization, can be made only on the experience of the past. This was unquestionably the approach of the staff of the commission with the commission's full approval, if not as the result of a directive from it.

"It seems to me, however, that in dealing with our domestic economy, which has so far outstripped the rest of the world, with the sole exception of Canada, in a steadily rising standard of living resulting from our American philosophy of 'free enterprise,' such a projection of continued growth must depend on the assurance that this philosophy is to continue as the economic environment of our future. Without such assurance, the validity of the projection may be seriously questioned, or even discarded.

"I feel strongly that a supposedly nonpartisan objective approach to this problem of future requirements should not ignore by silence the unmistakeable departures from the basic philosophy upon which the United States economy has flourished in the past.

"If my thinking is sound, it should constitute the most important issue to our own industry as well as to the country as a whole in the coming election."

"A rehash of muddy Washington thinking."

S. H. WILLISTON
Vice President
Cordero Mining Co.
San Francisco, Calif.

"The President's Materials Policy Commission has apparently been unable to avoid the pitfalls of Washington bureaucracy. Mr. Paley and the other able members of the commission proper have sacrificed a great deal of time and effort to make a rehash of muddy Washington thinking.

"An examination of the list of staff members and a discussion of its members with production experts in the mining industry indicates few or none have had any actual mining experience within the last ten years, if then.

"On the staff are those who have been held responsible for the State Department's policy of keeping the American minerals in the ground, and pseudo-economists, who have long advocated an American "have not" policy and a desire to become entirely dependent on foreign sources of our raw materials. A few competent Survey and Bureau personnel have become completely submerged in the final results.

"The reserve figures for several of the minor metals are completely wrong.

"Probably the fundamental error of the committee's report has to do with its lack of recognition of one basic fact: domestic mining must pay for its labor in a tariff-protected climate. Through the actions of the Reciprocal Trade Pact and as a result of the depreciation of the value of the dollar, metal tariffs have declined to insignificant percentages.

"United States mining, save in exceptional cases, cannot live when it must pay for its labor and materials in a protected market and sell at world prices, yet this is exactly the basic recommendation of the five-volume report.

"The commission points out, but does not emphasize, the fact that we were an exporting nation of copper, lead and zinc until the time of the adoption of the Reciprocal Trade Pacts but that since that time, we have been steadily importing from abroad larger and larger amounts of our raw materials.

"Washington has been endeavoring to export our mining industry for seventeen years and the Paley Commission recommends the continuation of that policy.

"I regret very much having to make as unfavorable a comment as this on the work of the commission, its able executive secretary and some few of its staff, for all of whom I have the greatest respect."

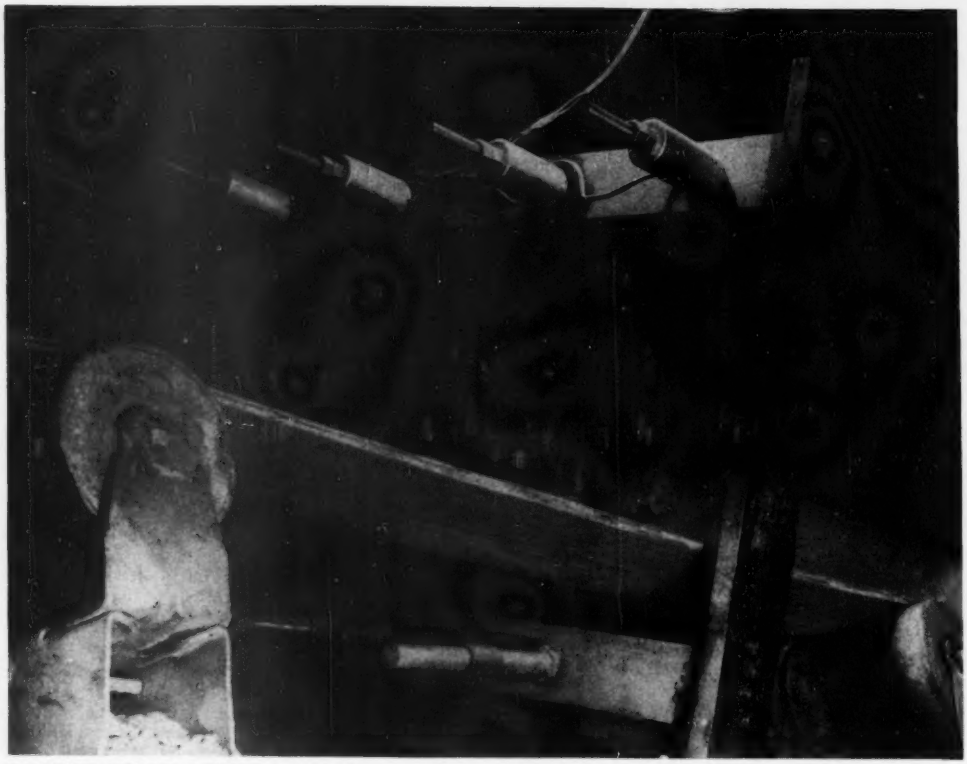
"A masterful consolidation of facts."

JAMES BOYD
Exploration Manager
Kennecott Copper Corp.
New York, N. Y.

"We in the mining industry have struggled for a long time to obtain sufficient understanding of our problems so that policy would develop in such a way that the industry could more successfully meet its obligations to the nation.

"The report of the President's Materials Policy Commission reflects the results of the most concentrated effort ever directed to this end. It is not the work of a group of inexperienced planners. Into it went untold hours of intensive search for the facts, which have been masterfully consolidated into a thoroughly understandable presentation. The commission has used all the tools of a modern complicated economy — statisticians, economists, hard-headed businessmen, and every level of the industries involved. I know no example of a government report which has been based on a more thorough attempt to obtain all viewpoints and to present them so masterfully.

"Because the industry is complicated by many differing viewpoints it is inevitable that some of the recommendations will prove to be unacceptable, and some, for fundamental reasons, should not be adopted. There is so much in the report that needs to be done, however, that attention should be focused on items which obviously demand immediate action. Attacks on the report as a whole, based upon specific objections, can only lead to destruction of its usefulness. Those points which are unsound will be ironed out in future debate. We owe a debt of gratitude to the members of the commission and those who assisted them in compiling the report."



MAGNETS BELOW BELT and coils above constitute so-called sensing unit of "around-the-belt" type for detector that has considerable ability to differentiate. See also Fig. 1 on the opposite page.

Simple Tramp Iron Detector Effective at Lower Cost

C. M. MARQUARDT
Electronic Engineer
Salt Lake City, Utah

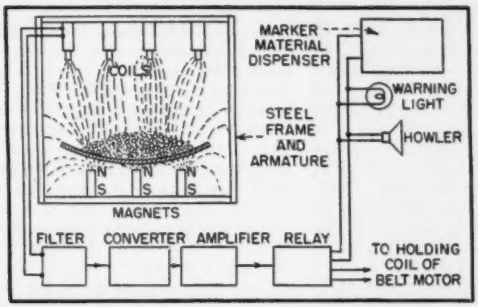
NEED FOR ADEQUATE MEANS of detecting tramp iron in mine and mill work was never greater than it is today. High-intensity surface magnets and magnetic pulleys, excellent though they are, offer no protection against the weakly magnetic high-manganese steels used in much equipment. No magnet will remove these steels from the ore stream. High-manganese steels are used because of their toughness. It is this toughness that makes the tramp so damaging to equipment.

Available tramp iron detectors have been costly to install and operate. Those of some well-known makes employ sensitive relays with delicate moving parts. To actuate such equipment, a strong magnetic field is required, usually furnished by a 2- to 5-hp. motor-generator set. These devices offer little or no protection against pieces of high-manganese steel.

Recognizing the need for a simple and reliable detector, which at the same time costs less than the others mentioned, I undertook the development of the electronic device to be described. It has been named the "Detramp."

The Detramp detector operates on the well-known principle that when a piece of iron is moved through a steady-state magnetic field, in which is placed a coil, a small electric current will be generated in the coil. This generation is due to the change in the flux linkages as the piece of tramp iron moves through the field adjacent to the coil and magnet.

When the tramp iron is on a conveyor belt that moves slowly, the rate of change of magnetic flux is correspondingly slow. The magnitude of the current generated is therefore small, unless an exceedingly strong magnetic field is used. The current generated is of low frequency and alternating, one cycle



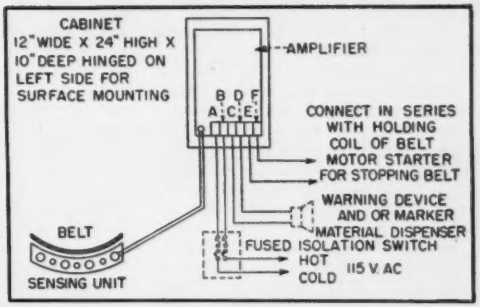
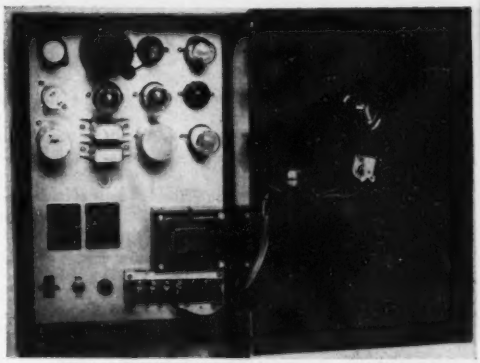

CABINET 12"WIDE X 24" HIGH X 10"DEEP HINGED ON LEFT SIDE FOR SURFACE MOUNTING
AMPLIFIER
B D F
A C E
CONNECT IN SERIES WITH HOLDING COIL OF BELT MOTOR STARTER FOR STOPPING BELT
WARNING DEVICE AND OR MARKER
MATERIAL DISPENSER
BELT
FUSED ISOLATION SWITCH
HOT
COLD
115 V AC
SENSING UNIT

FIG. 1 TRAMP IRON passing this "around-the-belt" sensing unit causes generation of small current, which is filtered, converted and amplified to trigger a thyratron tube to actuate warning device and, if desired, stop belt. Fig. 2, adjoining, gives details of amplifier hook-up, and shows a sensing unit of "under-the-belt" type.

Advantages Offered by the Detramp

1. **Simplicity of installation.**
2. **Low operating cost.**
3. **Ease with which the sensitivity may be changed to suit operating conditions.**
4. **Absence of delicate moving parts.**
5. **Employment of plug-in components.**
6. **Use of a much weaker magnetic field; hence, a material saving in costly Alnico magnets.**
7. **Elimination of the motor-generator set and its maintenance.**
8. **Conversion of a slow change of pick-up current to a 60-cycle per-second makes detection of high-manganese steels possible.**
9. **Auxiliary electronic plug-in delayed belt stopping unit.**
10. **Large pieces of metallic ore, such as galena, will not cause detection.**

WITH THIS UNDER-THE-BELT SENSING UNIT, extreme sensitivity is possible with lesser degree of selection.



AN AMPLIFIER UNIT. Compare with Fig. 2.

being completed while the piece of iron moves through the field. If the iron was weakly magnetic and moved at the speed of the usual conveyor belt, the current would be exceedingly small.

The new detector replaces the sensitive galvanometer or microrelay with an electronic circuit as shown in Fig. 1; it also replaces the motor-generator set and powerful electromagnet with a few small Alnico V permanent magnets. The equipment consists of two units, a sensing unit and an amplifier.

The sensing unit is made up of coils and magnets arranged in association with the belt, as shown in Figs. 1 and 2 and in the pictures. Coils of many turns are rigidly suspended in the magnetic field. A filter is provided to remove any pick-up voltage caused by stray alternating-current fields. The very-low-frequency current generated by the passage of the tramp iron is allowed to pass through the filter and thence to a converter which changes it to 60 cycles ac.

Changes Important

Two important changes have taken place at this point: First, an alternating current is developed which changes small low-frequency currents, due to the passage of weakly magnetic iron, into rapidly changing (60-cycle) alternating current. Second, there is available for amplification an alternating current. It is well known that alternating-current amplifiers can be made very stable. The entire unit will consume only 50 watts of power, compared to several horsepower.

In this way the small current is amplified to a point where it is large enough to trigger a thyratron tube with a relay in its anode circuit. When this tube is triggered, the relay is sharply actuated, causing a howler, light, or other warning device to actuate, and if desired, the belt to stop. Signals as small as 3-millionths of a volt (equivalent

to a current of 10^{-9} amp. in a 3,000 ohm relay) will trigger the thyratron, if desired.

Recognizing that the Detramp would often be employed in plants where electronic technicians were not available, the equipment has been conservatively designed, using special care to operate any component far below its normal rating. In consequence, replacement of tubes or components are infrequent. To make whatever maintenance may be required simple and easy, all filter capacitors, relays, and the converter are plug-in units. In the event of a failure, it is necessary merely to plug in a new component—as simple as changing a radio tube. One experimental unit has operated for more than four years without loss of a single component.

Employment of the filter, converter, and alternating-current amplifier has made it possible to reduce the magnetic field strength to a small fraction of that previously used. Instead of a large electromagnet for producing the field, three to eight Alnico V magnets are used. These are 5 in. long and 1 in. in diameter. As a matter of fact, the unit can be made so sensitive to changes in the magnetic field, that the small but ever present changes in the earth's magnetic field will actuate the relays. To prevent this it was necessary to develop a special means of connecting the coils to the amplifier.

Depending on the application and its requirements, two types of sensing units are available. In most crushing plants there is a lower limit of tramp size which it is desired to detect. Most operators would like rock bits, small nails (14d and smaller), pieces of cable, and the like to pass undetected, as frequent belt stoppages for such small pieces of tramp iron are annoying and time-consuming. Where this is the case, an around-the-belt sensing unit is employed. Such a unit is shown. In it the magnets are below the belt and the coils are above. This unit permits a considerable degree of differentiation.

For Greater Protection

Where maximum protection is wanted, regardless of the size of the tramp iron, an under-the-belt sensing unit is employed. Such a unit used on a 36-in. belt is shown. With it, extreme sensitivity is possible, but with a lesser degree of selection. It is recommended for maximum protection against high-manganese steels when surface magnets or magnetic pulleys are used. By placing an under-the-belt unit downstream from a magnetic pulley maximum protection can be obtained against even small pieces of high-manganese steel, as well as the highly magnetic tramp iron that escapes the pulley. Frequent belt stoppages are avoided because most of the tramp has been removed before passing the sensing unit. This is the most effective means of protecting crushing equipment against the damaging effects of high-manganese steels, because no magnet, however powerful, will remove them.

At some operations it has been found desirable to stop the belt at some point beyond the point of detection of the tramp iron. For such applications a plug-in electronic delayed belt stopping unit is available. This unit plugs into the amplifier unit, as an auxiliary feature. When used, it will delay the stopping of the belt from one to ten seconds. Should another, closely spaced, piece of tramp iron come through, the first piece causes the belt to stop, but a warning is sounded for the second piece so that it will not be overlooked. As soon as the belt stops, the delayed stopping unit resets itself for the next detection, instantly and automatically. Also available is a marker material dispenser that may be employed to drop a spot of different colored material, such as lime, on the belt to mark the spot where the tramp iron is situated. When the belt is heavily loaded, much time is saved in locating tramp by means of this device.

The Detramp is also well adapted for the protection of long conveyor belts against long pieces of tramp which sometimes wedge themselves under belts, causing serious tears. A unit so employed and set very insensitively can be used to sound a warning or stop the belt when a large piece of tramp passes the sensing unit. I have had a case brought to my attention in a large western coal mine where a long nail bar was flipped around by the magnetic head pulley so as to wedge between the idlers and cause a tear more than 900 ft. long in a 48-in. slope belt.

Plant Tests Favor Use of Electrolytic Manganese

ELECTROLYTIC MANGANESE made from low-grade domestic ores can be substituted for ferromanganese made from high-grade foreign ores in some of the latter's applications. This has been established by tests conducted in cooperation with industry, according to Bureau of Mines Report of Investigations 4861, recently issued.

The tests show that electrolytic manganese is superior to other grades for some purposes because of its high purity. In the test 46 producers tried the electrolytic metal made at the Bureau's Boulder City station. More than 1,200,000 lb. had been given them. Of these producers, 36 make ferrous metals, five nonferrous metals, and four produce welding rods.

Prepared by Frederick Sillers, Jr., metallurgist, the report says that the only serious objection that can be raised against electrolytic manganese is its cost.

Tests show that electrolytic manganese is desirable for stainless steels and welding rods because of its virtual freedom from phosphorus and carbon.

Some question has been raised as to hydrogen which is present in electrolytic manganese as deposited. However, it has not been established with certainty, as alleged, that occasional wildness in heats or poor arc stability in welding experiments has been due to this cause.

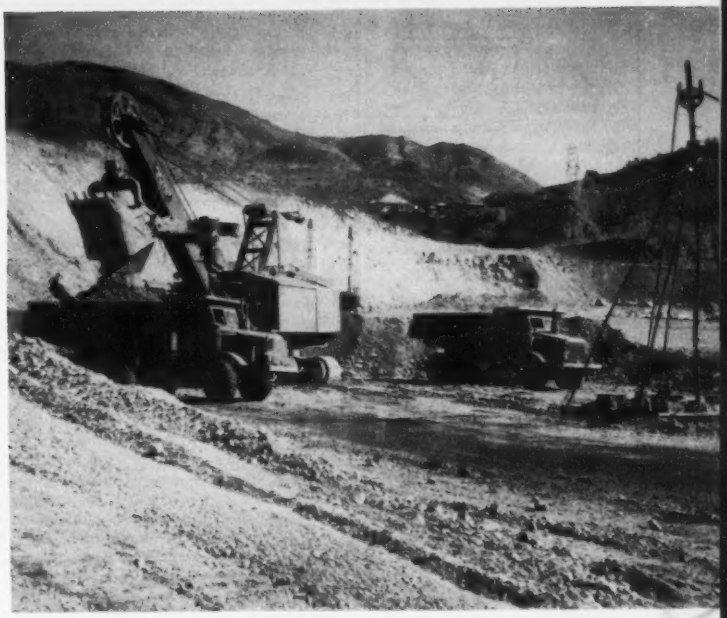
The tests are said to have proved that electrolytic manganese is satisfactory in making alloy saw, chisel and die steels by the basic electric process. Manganese recoveries in this case averaged 100%. Similar recoveries are also obtained in low-alloy steels. The electrolytic metal was used successfully also in Hadfield manganese steel, and in acid electric furnace manufacture of steel casings.

Proof was also obtained that electrolytic manganese can be added with equal or superior results to basic open-hearth steel if it is put into the ladle. With one exception, recoveries of the manganese are at least equivalent to those of ferro.

The report also says that electrolytic manganese proved satisfactory in acid-open-hearth practice; in treating acid bessemer screw steel; and on gray-iron castings and alloy cast iron. It can also be substituted for spiegeleisen in making malleable iron in the air furnace.

Are Your Large Portable Machines Properly Grounded?

If not, workmen may be killed or injured by ground faults or lightning disturbances. Check your open-pit or underground units against the recommendations made by these competent authors.



GROUNDING of large electrical open-pit machines like this is discussed here.

D. STOETZEL, JR. and S. C. COOKE
Industrial Engineering Dept.
General Electric Co.
Schenectady, N. Y.

LARGE PORTABLE MACHINERY, such as electric shovels and machines of a similar nature, are not located on permanent foundations and normally receive power by flexible trailing cable at a relatively high voltage. Voltage levels of 2400 v. or 4160 v. are common. Such machines as these present serious problems with respect to the safety of operators and attendants on the occurrence of ground faults and also with respect to protection against damage from lightning disturbances. The term ground fault is used to describe the condition during which contact is made between a line conductor or motor winding and a point at or near ground potential. This occurrence is most commonly caused by the failure of insulation.

Death can be caused by as little as $\frac{1}{16}$ amp. flowing for one second, and an even smaller amount can cause the loss of muscular control. These currents can flow through the human body at voltages as low as 100 v., if the skin is moist.

The following general rules should be followed:

1. A person should not come into contact, even momentarily, with voltages above 100 v.

2. Persistent shock hazards of even lower voltages should produce automatic tripping of the electrical circuit.

Cause of Shock Hazard

If, for any reason, an electric conductor in a grounded system contacts the frame of a portable machine, or any metal part connected to the frame, a ground current will flow from the frame to earth. This current causes a voltage difference between the frame and ground due to the contact resistance between the two. In the case of a portable machine, the electric connection between the frame and the surrounding earth is a poor one and, hence, a dangerous voltage can be developed when ground current is flowing. This voltage, approximately equal to the product of the ground current and the frame-to-ground resistance, produces a definite shock hazard to personnel.

Personnel in the vicinity of portable machines may come in contact with this frame-to-ground voltage in various ways. Workmen often sit on the ground next to the machine with their backs against the "cats" during idle moments. In making adjustments or repairs to the dipper, the workmen usually will be standing on the ground at some distance from the base of the machine and will be touching the metal parts of the dipper as shown in Fig. 1. Frame-to-ground voltage developed during ground faults will be transmitted along all metal of the shovel, such as, compressed air, fuel, or water lines, drag chains, tow cables, or any other metal parts connected to the frame. Therefore, between these metal parts and ground an individual is subject to a definite shock hazard.

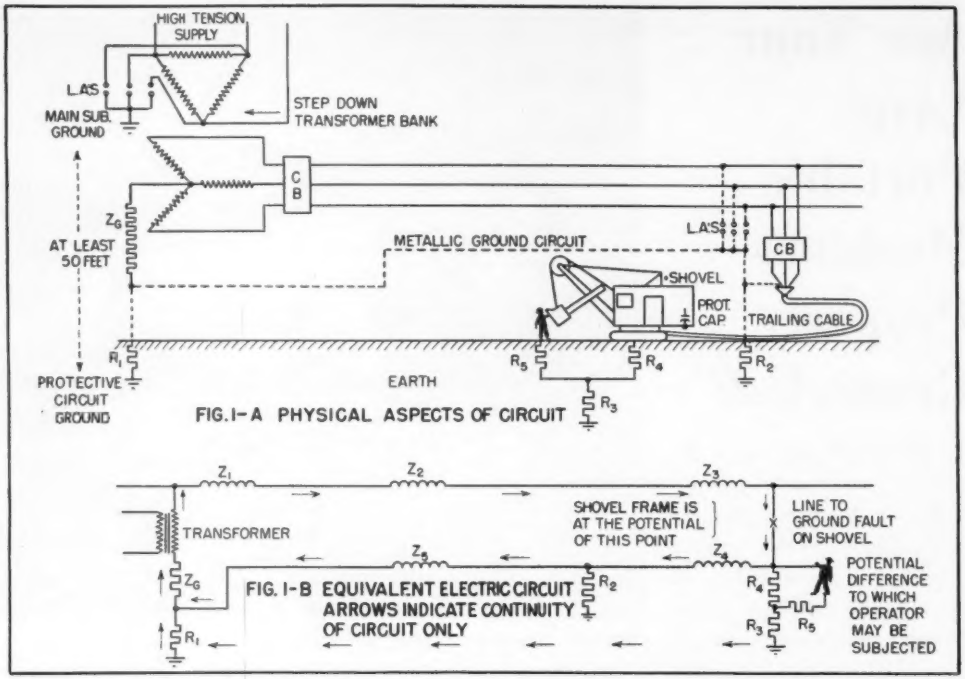
Factors in Shock Hazard

The factors which affect the shock hazard problem are illustrated in Fig. 1A and 1B. The two most important factors with respect to the shock hazard are:

1. Magnitude of ground fault current.

2. Resistance from machine frame to ground (R_4).

The ground fault current which will flow upon the occurence of a ground fault is determined by the power supply voltage acting on the fault circuit impedance. The normal power system impedance composed of the substation transformer, transmission line, and drag cable impedances (Z_1, Z_2, and Z_3) are of



FIGS. 1A AND 1B SHOW WHAT HAPPENS when fault occurs causing current to flow from equipment frame to ground. If a workman touches ground and frame, he may be electrocuted without proper protection.

necessity relatively low to permit proper performance of power equipment connected to the system. The fault current might be in the order of thousands of amperes if it were limited only by these impedances. A protective system designed to handle such large ground currents without creating dangerous shock voltages would require a very extensive and costly low-resistance grounding circuit for the portable machine. However, another means of limiting the shock voltage is by reducing the current which will flow on a ground fault occurrence. This can be done with no sacrifice in the power machinery performance by introducing a neutral grounding impedance (Z_g).

Neutral Impedance Needed

It is recommended that a resistor be used as the neutral grounding impedance to limit the ground fault current for two reasons: First, to avoid the twice normal transitory current magnitude encountered with reactance, and second, to avoid the relatively high switching and arcing ground transitory overvoltages which would be permitted by low-current reactance grounding.

The portable machine frame-to-ground resistance is very indefinite. Even under favorable circumstances the ground resistance will not be low and it may be 100 ohms or more on rock formations. Even a group of driven ground rods at the line end of a trailing cable may have a ground resistance of 10 ohms or more unless the installation is carefully made and maintained. It should be noted that even with a 10-ohm ground and a ground fault current of as low as 100-amp., that a shock hazard potential of 1000 v. between machine and ground could occur.

Available shock hazard information and data indicates that the possible voltage from frame to ground should not be allowed to exceed 100 v. and that adequate relaying should be provided to de-energize the circuit immediately upon the occurence of a ground fault. A ground fault current of 50 amp. and a total grounding resistance of 2 ohms have been selected as a satisfactory arrangement. A reliable ground circuit resistance of 2 ohms requires a ground return conductor from the frame of the portable machine back to the supply substation, as shown by impedances Z_4 and Z_5 in Figure 1B. Since the parallel ground paths are so variable, this return circuit alone is designed to come within the 2-ohm limit. This practice assures adequate safety even if the ground resistance of the other ground paths is very high. For example, even if the resistance of the other path is infinite and the ground fault current is limited to 50 amp., the maximum voltage which can occur between frame and ground is 100 v.

Upper Limit—100 V.

Although 100 v. has been selected as the upper limit of allowable voltage, it is not expected that this voltage will actually occur in most cases. For example, to have 100 v. within reach of any of the personnel would require that the resistances R_1, R_3, and R_5 be zero and the resistance R_4 be infinitely high. Under these conditions a man as shown in Figure 1B could be exposed to the full 100 v. from frame-to-ground. Any other values of resistance would tend to reduce the 100 v. figure.

Circuit Protection

To remove circuit elements which have experienced insulation failure and the resulting ground fault, circuit breakers should be located to isolate the faulty circuit elements. Since it is not normally desirable to shut down the entire system because of a ground fault in one of the shovels, circuit breakers should be located so that the system can be switched in smaller sections. A common arrangement is that of having circuit breakers at the main substation feeding individual pole line circuits which go out to the portable machine areas. Along the pole line at the point at which feeders are tapped off to supply portable equipment, a portable switch house is commonly used and this switch house includes a circuit breaker. From the portable switch house, or cable-skid, feeder cables are run to individual shovels. Therefore, by proper detecting means, selectivity in circuit breaker tripping can be attained so that upon the occurrence of a ground fault only the faulted portion of the circuit is de-energized and the remainder of the system continues to operate as normal.

As mentioned before, upon the occurrence of a ground fault and the possibility of shock hazard, it is essential that the system be de-energized.

Simultaneous Ground Faults

Up to this point we have been discussing systems which have their neutral point grounded through a current limiting resistor which allows ground fault current to flow which in turn can be detected by proper relaying means and initiate circuit breaker tripping action. However, the question arises as to how a delta-connected or ungrounded system would be handled. In an ungrounded system the occurrence of a ground fault does not permit much ground fault current to flow and hence does not normally cause voltages which create a shock hazard. However, such systems are subject to simultaneous ground faults, perhaps at different locations in the system, with the net result of a line-to-line fault, as shown in Fig. 2. Often on such systems as this, when the first ground appears, nothing is done about it immediately and, hence, if a second ground occurs before the first has been removed the line-to-line fault condition exists. When the line-to-line fault occurs, the fault current which flows is not limited by any such impedance as the neutral grounding resistor used before, but rather is limited only by the impedance of the system elements. Therefore, the fault current is quite high and this short circuit current will flow in the ground circuit between the two fault locations. This current flow can produce unsafe voltages and expose personnel to very high shock hazards. To avoid this, automatic switching equipment must be applied which will function immediately upon the occurrence of the first ground fault to prevent the occurrence of simultaneous ground faults. On an ungrounded system ground detector, equipment is employed to detect on the first ground fault and then operates to clear the entire system since with such operation, there is no way of telling upon which feeder circuit the ground fault has occurred. This in most cases is not acceptable as an operating procedure.

Because of the operational shortcomings as mentioned above, it is most common to have portable machinery supply circuits supplied from wye-connected transformers with neutrals available for grounding. This provides ground fault current upon the occurrence of a ground fault such that relaying can be employed to selectively trip the circuit breakers.

Inspection A "Must"

Even though the neutral grounded system essentially eliminates simultaneous ground fault conditions, it is not a guarantee against such occurrences. Routine periodic inspection and maintenance programs are essential to assure safe operation of any electrical system.

In some cases the source transformer is not wye-connected, but rather is delta-connected. It is still possible to ground the neutral of the system by the use of a zig-zag connected grounding transformer. Such a grounding transformer has the characteristic of presenting a very high impedance between lines but, upon the occurrence of a ground fault, presents a very low impedance path to the flow of ground fault current. Therefore it is ideally suitable for deriving a neutral point from which a grounding resistor can be connected to ground.

In the application of the grounding transformer, however, some care should be used in the selection of the transformer. If a grounding transformer is selected with too high an impedance, the system is subject to damaging transient overvoltages, similar to those that can occur on ungrounded or low current reactor grounded systems. Causes of these transient overvoltages are beyond the scope of this article but have been investigated by a subcommittee of the American Institute of Electrical Engineers. This subcommittee's findings show that these damaging overvoltages can be eliminated if the zero-sequence reactance of the system does not exceed ten times the positive-sequence reactance. In other terms, this means that the grounding transformer impedance should be no higher than necessary to limit the ground fault current to 25% of the three-phase fault current. Any further reduction in ground-fault current should be made by a neutral impedance as used with the ordinary wye-connected transformer.

Isolating Ground Faults With Protective Relays

With the grounded neutral system, sensitive residual relays can be utilized at the various circuit breaker points to detect presence of ground-fault current and to selectively relay the circuit breakers such that the ground fault is isolated by disturbing as little as possible of the overall system. Because of the low value of ground fault current (50 amp.) careful attention must be given to the selection of current transformers and protective relays to be sure of proper operation of these devices. Since the magnitude of the ground fault current will be practically identical throughout the entire distribution system, the desired selectivity must depend on the element of time. The protective relay associated with an individual branch circuit to a particular shovel can be made nearly instantaneous in operation upon the occurrence of ground-fault current. The main feeder breaker at the substation should be timed out to wait approximately ½ second before giving a tripping signal. The back-up protection at the substation, which is actuated by current in a neutral resistor circuit, should be timed out at least ½ second longer than the time requirement of all other ground protective equipment. All protective relay equipment should be sensitive to current magnitudes of about one-third the solid ground fault value so as to assure adequate current for relay operation. "Window" type current transformers should not be used for actuating ground protective relays in these systems unless their characteristics have been very carefully

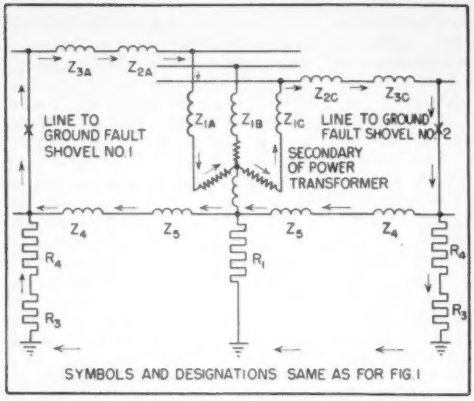


FIG. 2. HERE WE HAVE two simultaneous faults resulting in a line-to-line fault which could be dangerous

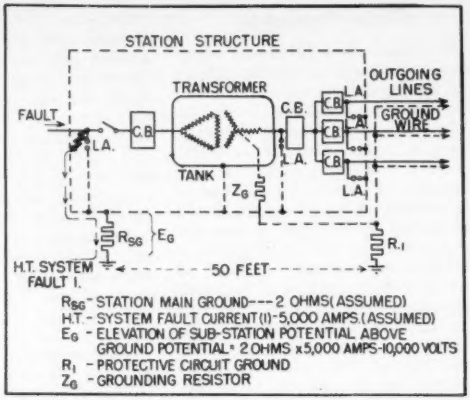


FIG. 3. BE SURE THAT there is no physical connection between high-voltage ground (R_{sg}) and ground (R_1).

checked at the operating burden imposed by the protective relay to insure positive operation of the relay at currents well below the 50 amp. limit.

Lightning-Protection Consideration

Lightning impulse voltages are characterized by steep-wave-front voltage surges of short duration, which travel along an electric conductor in the manner of a wave. Such voltages may be imparted to the electric distribution system by direct contact of a lightning stroke, or by induction as a result of a nearby lightning discharge. Lightning impulse voltages originating on the high-tension supply system will, in general, be transmitted through the substation step-down transformers, reduced in magnitude, approximately the same as the normal transformation ratio.

Voltage and current magnitudes, associated with the direct discharge, may be very high—thousands of amperes and millions of volts. Most of this surge will pass on to earth at the location of the discharge stroke, since the electric circuits with which we are dealing, are incapable of supporting such high voltage levels. A minor surge, whose peak value does not exceed the flashover limits of the line, will be transmitted along the electric-circuit conductor away from the point of discharge.

For a short-time, steep-wave-front impulse surge, the impedance represented by the electric conductors is very much higher than the normal 60-cycle value and will ordinarily be in the order of 200 to 500 ohms. The effectiveness of ground connections along the transmission-line circuits is consequently much greater for impulse surges than for normal 60-cycle currents.

The minimum electric shock current which will produce injury to personnel, becomes greater as the duration diminishes. Strangely enough, the boundary relationship for shock hazard is represented by a constant of value of I^2t. For a current duration of 100 microsecond (1/10,000 second), a current of 16 amp. could be permitted before the fatal shock boundary is reached for an adult.

What To Do About Lightning

It may be reasonably concluded that lightning impulse voltages, originating on the pole-line distribution system, or on the primary high-tension supply system, can be easily dissipated and not constitute a serious hazard to personnel working near portable machines. The lightning protective problem for the distribution system thus becomes one of adequately protecting electrical equipment which forms a part of that system.

The shock hazard associated with a direct lightning stroke to a portable machine is a real one and extremely difficult to eliminate. Numerous possibile protective systems have been investigated but all involve a large number of driven rods or metal mats surrounding the portable machine. This seems hopeless to attain in practice. Often a thunderstorm means a temporary shutdown of operations anyway. Thus during the danger period of the storm, the personnel should seek shelter in the metal cab of the machine or at a spot well removed from the machine. *To stand on the ground near a portable machine is about as dangerous as standing under a tree.*

The lightning protective equipment at the main substation should consist of the protective devices which would normally be applied to a substation of the same size and voltage ratings. Lightning arresters should be applied at the junction of the trailing cable and the pole-line feeder to limit the maximum line-to-ground voltage permitted. Surge protective capacitor equipment should be applied on the load side of the circuit breaker, within the portable machine, to reduce the slope of the wave front for the protection of rotating machines. A fairly good driven ground should be established at the tap-off station, to which the protective ground circuit as well as the lightning arrester ground leads should be connected.

Grounds at Substation

One important point concerning the design of the main substation should be mentioned here. The ground-fault current which may be supplied by the high-voltage supply system, is not controlled by the local electric-system design and may often be quite large. Any line-to-ground flashover at the main substation, will allow the high-voltage system ground current to flow into the main substation ground in the manner illustrated in Fig. 3. This current would persist for a time

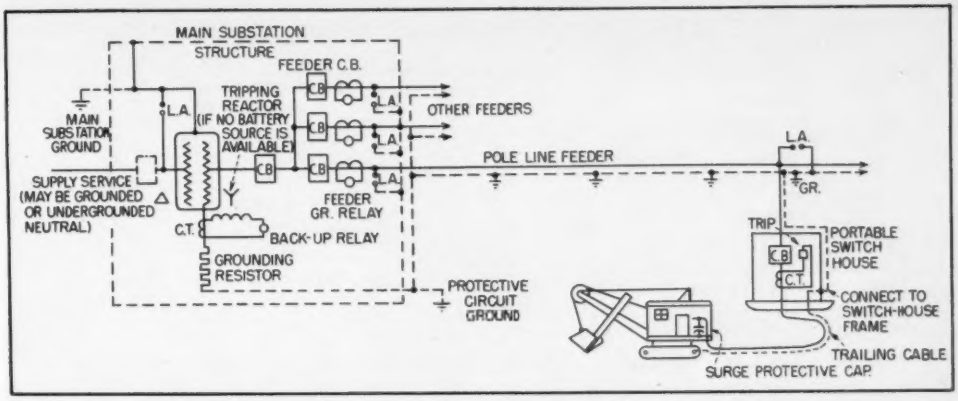


FIG. 4. A TYPICAL POWER SYSTEM with grounded neutral which supplies loads to portable machines safely. This ideal installation incorporates the recommendations for safe practice as outlined by the authors in this article.

interval governed by the switching time of the high-voltage protective circuit breaker. A 5,000-amp. ground-fault current (which might easily be equalled or exceeded), in combination with the main substation ground resistance of 2 ohms (which would be considered as a good station ground), would cause the entire main substation structure to be elevated 10,000 v. with respect to the ground, and remain at this potential until the high-voltage-system protective circuit breaker operated (probably ¼ to 1 second). If the portable-machine circuit protective ground were physically interconnected with the main substation ground, it is obvious that this high potential would be distributed to the frames of all portable machines and thus constitute a serious hazard.

Why a 50-Ft. Separation

As a result of these considerations, it is recommended that the protective ground circuit, originating at the step-down transformer low-voltage neutral, be insulated from the main substation ground system with the same insulation level as applied to the low-tension line circuit, and grounded at an adjacent separate grounding connection. The voltage gradient in the earth surrounding the main substation diminishes very rapidly as one moves away from the substation. In general a 50-ft. separation between the two grounding terminals is sufficient to avoid any substantial coupling between the two ground beds, and any direct interconnection between these two grounds such as buried metal pipe lines, etc. should be avoided.

In Summary

In summary, it is recommended that the power supply system for large portable machinery be so arranged as to provide for neutral grouping to the system. This can be done by using wye-connected supply transformers or zig-zag connected grounding transformers on systems with delta - connected sources. Large portable machines should not be operated on power supply systems which do not have their neutrals grounded for the following reasons:

1. A single ground fault will not produce sufficient current for tripping off individual feeders. Therefore the entire portable machine power system must be de-energized. The location of the ground fault must be found by physical inspection or by successively disconnecting individual sections of the system.

2. If for any reason the feeder breaker is not tripped open upon the occurrence of a ground fault (relays are sometimes locked), the development of a second ground would permit dangerous voltages as previously explained.

3. Ungrounded systems are subject to higher transient overvoltages, as a result of circuit switching or restriking faults which increase the possibility of simultaneous line-to-ground failures.

To safeguard against shock hazards, the possible voltage from frame-to-ground should be limited to 100 v. This is accomplished by limiting the ground fault current by a neutral resistor to a value of 50 amp. and by providing a ground return circuit not in excess of 2 ohms. The enclosures or frames of all portable electric circuit equipment shall be solidly tied to the protective ground circuit, including portable switch houses, portable connection boxes, portable transformer stations on skids or trucks, metallic cable sheaths or brads, etc.

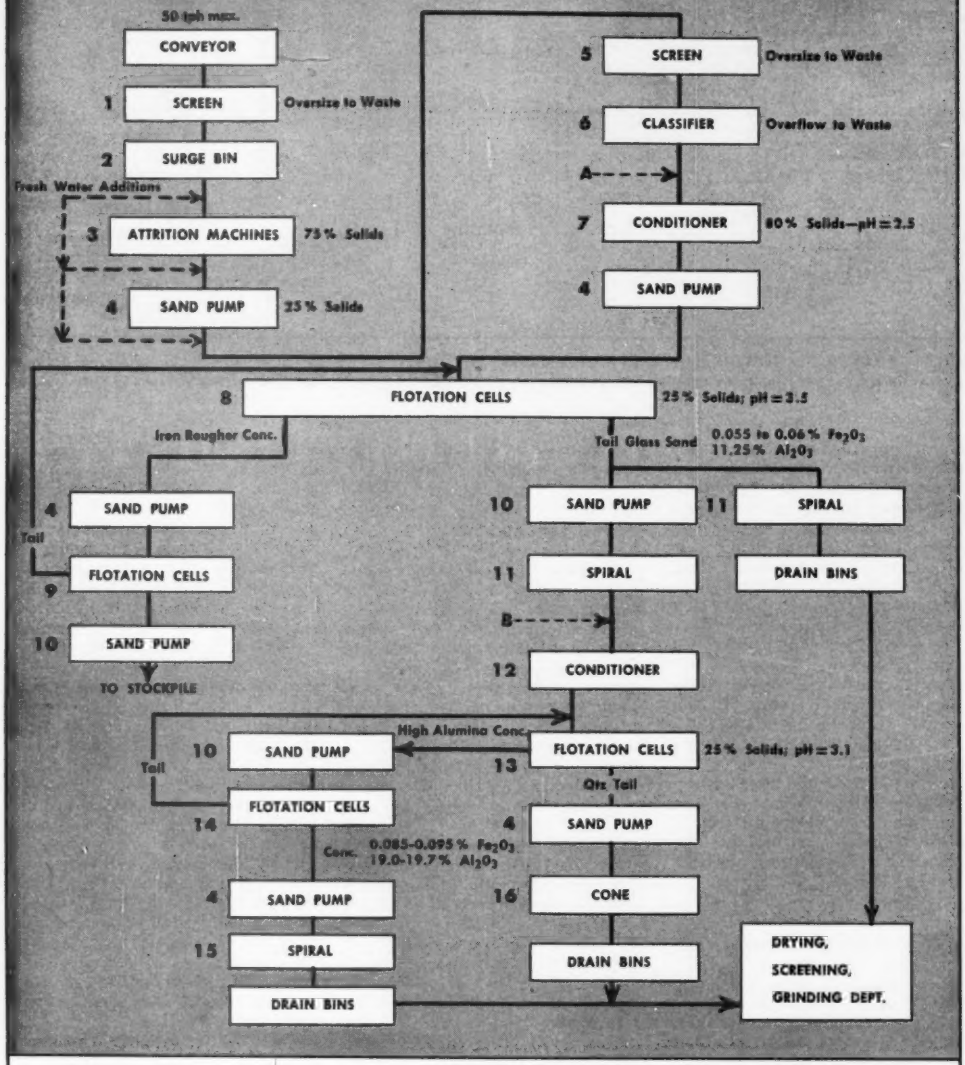
The protective ground circuit at the main substation shall be kept insulated from the main substation structure and ground terminal. A separate ground terminal physically separated from the main substation ground system should be used for grounding the protective ground circuit. The distance between these two grounds should be at least 50 ft.

Properly selected current transformers and relays should be applied at each switching point to provide for selective ground fault current protection. In addition, a back-up ground fault relay should be provided and connected to a current transformer in the ground resistor circuit at the main substation to trip the main transformer breaker in case of failure of feeder breakers to clear the ground fault.

At each tap-off station from the pole line, a ground terminal, consisting of several driven rods, should be provided. The protective ground circuit and the lightning arrester ground connection should be solidly connected to this ground terminal.

Fig. 4 shows a typical power system for supplying portable machine loads and illustrates the points discussed in this article.

FLOWSHEET PEBBLE BEACH PLANT, DEL MONTE PROPERTIES CO., CALIFORNIA



LEGEND

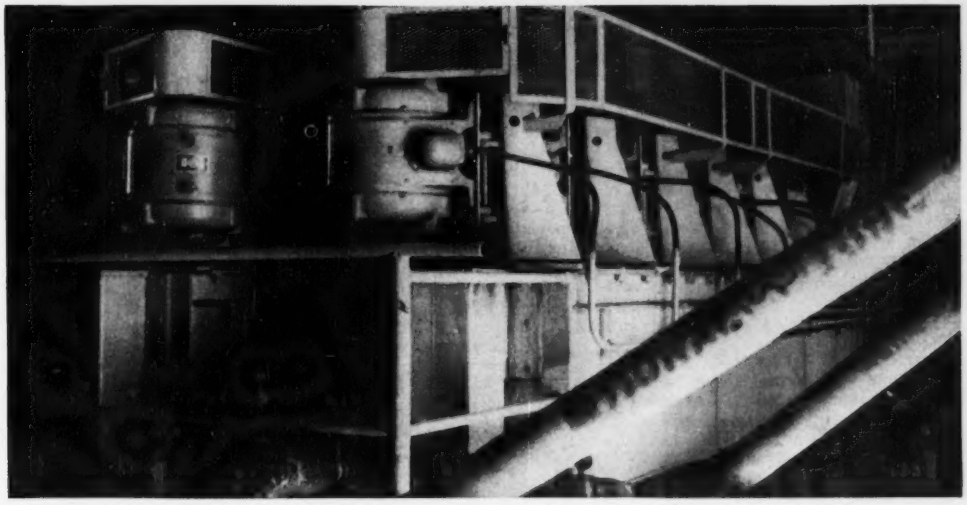
1. 4 x 12-ft. Allis-Chalmers screen, ¾ mesh
2. 80-ton surge bin
3. Three Wemco 6-cell attrition machines
4. 4-in. Wemco sand pump
5. 4 x 6-ft., 20 mesh Tyrock screen
6. 48-in. Wemco spiral classifier
7. 8 x 12-ft. standard drum-type horizontal sand conditioner
8. Twelve No. 60 Steffensen rougher flotation cells
9. Five No. 20 Steffensen flotation cells
10. 3-in. Wemco sand pump
11. 36-in. Wemco dewatering spiral
12. Three 3 x 3 x 6-ft. Wemco vertical conditioners
13. Eight No. 20 Steffensen flotation cells
14. Three No. 20 Steffensen flotation cells
15. 24-in. Wemco dewatering spiral
16. Dewatering cone

A. Flotation Reagents: Iron Section

Sulphuric Acid	0.60 lb/t.
Fuel Oil	0.35 "
Amer. Cyan. 801	0.65 "
Amer. Cyan. 825	0.40 "
Pine Oil	0.05 "

B. Flotation Reagents: Qtz Section

Hydrofluoric Acid	0.70 lb/t.
Armour Amine	0.40 "
Pine Oil	0.10 "
Reagent 31	0.05 "

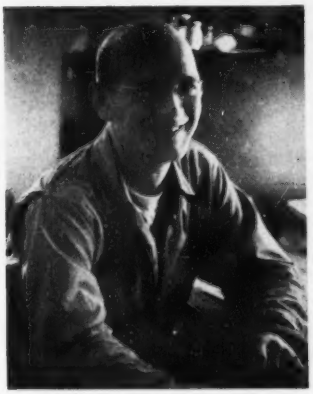


ATTRITION MACHINES scour and scrub the sand pulp (75% solids) without grinding the individual grain particle, before treatment in flotation cells. Capacity of three of these six-cell units is 1,000 tons a day.

Modernizing the Production of Silica Sand

Gravity methods formerly used for the beneficiation of dune sands have been successfully replaced by the flotation process.

OPERATIONS OF DEL MONTE Properties Co. at Pebble Beach, Monterey County, Calif., are unique in several ways. First there is the locality and nature of the sand deposits itself, and successful treatment of the mined sands by flotation. It is indeed a rarity to find a mining enterprise in a region noted for its scenic beauty, as are the company's Del Monte Forest holdings on the Monterey Peninsula dotted with magnificient homes, divers recreational facilities, and served by fine roads, among them the famous 17-Mile Drive. The new processing plant is one of the few in the United States using special attrition and flotation equipment to produce a large number of products for use in the manufacture of glass, ceramics, building materials, foundry sand, and others.



W. E. MESSNER is manager of the Del Monte sand plant.

The sand deposit occurs in dunes derived by erosion of underlying granitic rocks at Pebble Beach. Raw sands are composed of about equal parts of quartz and high-alumina minerals, with an Fe_2O_3 content ranging from 0.12 to 0.15% and an Al_2O_3 content averaging 11.5%. Small amounts of mica, monazite, ilmenite, garnet, and zircon are present. The material is almost white in color and will pass a 20-mesh screen. Equipment for removing the sand from the deposit consists of an RD-7 Caterpillar tractor fitted with a dozer blade and a ¾-cu. yd. clamshell crane for transfer to a feed bin ahead of the 16-in. belt conveyor system leading to the stockpile a short distance from the processing plant. Transfer to the plant proper is via an incline belt conveyor.

The new flotation plant is a steel frame structure covered with corrugated asbestos and concrete sheets. The equipment layout and flowsheet are such as to permit multi-circuit operations. For instance, the raw plant feed can be treated to produce standard glass sand or quartz and high-alumina concentrates. The iron-bearing heavy material or concentrates made in the primary flotation circuit containing mica, monazite, ilmenite, garnet, and zircon is stockpiled, pending retreatment in a special plant to be erected at some future date. In the sub-basement

of the building are a battery of Wemco sand pumps to direct pulp and concentrates to respective treatment units, and three 18x30-in. Sutorbilt rotary blowers, driven by 125-hp. motors, which supply air at 5 psi to the flotation machines. Capacity of each blower is 3,500 cfm. All plant machinery units are controlled from a central control panel. The new plant was designed by Western-Knapp Engineering Co., a division of Western Machinery Co., and erection was done with Del Monte personnel.

Attrition Machines

Current treatment methods and plant flowsheet are the result of lengthy experimental and test work done by company engineers in collaboration with flotation staff members of American Cyanamid Co. Details are given in the accompanying flowsheet. The process involves treatment in attrition machines; primary flotation for removal of iron concentrates; flotation of primary flotation tailings for separation of quartz and high-alumina concentrates; and dewatering of final quartz and high-alumina concentrates.

Three Wemco six-cell attrition machines operating in parallel, following conversion of the sand into pulp of 75% solids, scour and scrub without grinding the individual grain particle before treatment in flotation cells. As built, the machine is a streamlined version of the unit first developed by the Owens-illinois Co., with several patented features incorporated in the design. The individual cell is octagonal in shape, and on the motor-driven vertical impeller shaft are mounted three rubber-covered six-blade impellers. Pitch of the impellers in each cell is alternated so that in cell 1 the top impeller throws the pulp downward. Rotation is clockwise, and the pulp passes from cell 1 to cell 2 through an opening near the bottom of the partition between cells. In cell 2 the impeller pitches and direction of rotation is the opposite to cell 1, and the pulp flow to cell 3 is through an opening near the top of the partition between cells.

Volume content of each cell is 8½ cu. ft. Time required for the pulp to pass through the six-cell machine is about 18 min. The first two impeller shafts at the feed end of each machine are driven by 15-hp. motors, and all others by 10-hp. motors. Capacity of the three units is about 1,000 tons of sand a day.

Finished concentrates (see flowsheet) containing from 0.085 to 0.095% Fe_2O_3 and 19 to 19.7% Al_2O_3 after treatment in a 24-in. Wemco dewatering spiral go to the drain bins. To these bins also go the quartz tailings from the rougher machine. This material contains from 0.022 to 0.025% Fe_2O_3 and 0.5 to 1.0% Al_2O_3. Dewatering is done in an Allen-type cone.

Subsequent treatment received by the glass sand, quartz, and high-alumina concentrates stored in the drain bins includes drying in two gas-fired 5x16 ft. rotary driers and coolers, and screening and sizing on three Tyler Hum-mer vibrating screens. Oversize and undersize from these units go to respective storage bins for shipment in bulk in railroad cars or trucks and automatic sacking in St. Regis sacking machines. The grinding section handling screen undersize materials contains two 8-ft. by 60-in. Hardinge pebble mills with air classifiers. A new unit housing a 10-ft. by 96-in. Hardinge pebble mill and air classifier is nearing completion. Ground materials are automatically sacked for shipment.

S. F. B. Morse, is president of Del Monte Properties Co.; P. C. Valentine, sales manager; Wm. E. Messner, plant manager; Charles J. Houseman, plant superintendent; and Henry Benech, metallurgist.

Intensified AEC Activity Shown in 12th Semiannual Report

WHETHER J. STALIN blows hot or cold, the U. S. Atomic Energy Commission's program continues to move in high gear. Key point in the program is the production, procurement and development of new sources of raw materials, principally uranium, and according to AEC's Twelfth Semiannual Report, covering January to June 1952, this department is holding the pace with almost phenomenal expansion. Take a look at the record.

New ore-buying stations are planned at Greenriver, Utah, and Edgemont, S. D. Greenriver will provide a market for ores from Temple Mountain and surrounding area west of the Colorado River. American Cyanamid Co. will operate the station at Edgemont to serve the booming Black Hills area.

A processing plant is planned for the ore-buying station at Shiprock, N. Mex., operated by AS&R, to handle ore from Lukachukai. Anaconda is going ahead with construction of buying station, sampling plant and mill at Grants, N. Mex. Several existing mills enlarged their capacity this year and further expansion is planned.

Uranium from phosphoric acid nears actuality with Blockson Chemical Co.'s new plant nearing completion at Joliet, Ill. Initial production is expected this year and pilot plant studies are under way at other plants.

Bonus payments for initial production have provided a substantial incentive for development of new mines. More than 450 properties have been certified for payments of over $600,000 since this bonus was announced in 1951.

At a cost of nearly $4,200,000, 783 mi. of access roads have been provided under the Federal Aid Highway Act of 1950. Additional projects are on the books.

Over 1-million ft. of drilling sponsored by AEC, was completed in the year ending June 30, 1952. About 1,500,000 ft. is planned for fiscal 1953. Private mining companies are also increasing their drilling programs.

Over $475,000 in DMEA loans were approved in the last six months for exploration and development at 14 uranium mines.

About 22,500 mi. of airborne radioactivity surveying was completed on the Colorado Plateau in the year ending June 30. Approximately 50,000 mi. of flying is planned for fiscal 1953. One-third of this will be carried on simultaneously with aeromagnetic surveying from the same plane.

The commission's report also covers the other phases of their program and makes interesting reading. Here for example is an excerpt from the chapter on military applications.

"A large part of the total national effort in the atomic energy field continued to be directed to the military aspects . . . Production of atomic weapons proceeded steadily. Research in a variety of subjects continued to yield new developments applicable to weapons; work continued on the application of these improvements to the design of specific weapon models to meet the various needs of the Armed Forces."

You can get the full report from the U. S. Government Printing Office, Washington, D. C.

E&MJ Triptalks—The West Indies

This page is devoted to bringing you those interesting bits of information the editors of E&MJ pick up in their travels that might not otherwise get into print. Turn to it for a quick look at the districts we've visited.

THE TRIP: The West Indies, including Puerto Rico, Haiti, Jamaica, Cuba.

THE EDITOR: A. W. Knoerr

AT MATAHAMBRE, Rog Pierce, consulting engineer, chats with Dr. Romagosa, president of the famous Minas de Matahambre.

Puerto Rico is a tax Utopia. Since World War II some 168 U. S. firms have migrated there, attracted by the Island's grant of tax relief to all new industries until 1959. Then they start breaking you in easy until by 1962 you pay the full 20% corporation rate. Puerto Rico's labor supply is ample. It's the third most populated area in the world. (Java's first, India second.) This means plenty of workers—also consumers.

Were you surprised in the last issue to learn that Puerto Rico has sprouted a new iron mine? If so, keep your eye on the West Indies for more future iron mines. In addition to Cuba's productive iron mines, there are lateritic iron ore reserves exceeding 1-billion tons in Cuba, and large deposits in Puerto Rico. Some day smart metallurgists are going to work out an economical process to separate the iron from the chromium, nickel, and aluminum in these deposits.

Conspicuous red gossan outcrops in the Province of Pinar del Rio, Cuba, clearly visible by plane, suggest that there ought to be more good orebodies in this area—perhaps another Matahambre.

Sherwin Kelly's geophysicists were stringing out wires for self-potential surveys in western Cuba. With all the surface oxidation in evidence, this method should pick up some good results.

One of Matahambre's sidelines is forestry. The company runs a tree nursery, and has already planted about 400,000 eucalyptus trees for future generations.

We still can't understand why more mines do not pump their tailings back into the mines for fill as they do at Matahambre, where this method was pioneered. It offers the combined advantages of minimizing stream pollution, reducing dilution, preventing slabbing of stope walls, and providing safe working places for the men. The process is much simpler than most mining men realize.

In *E&MJ*, June 1948, the late Dr. O. C. Schmedeman, of Reynolds Mining Corp., reported bauxite reserves of about 350-million tons, chiefly in Jamaica, also in Haiti and Dominican Republic. Today Kaiser, Reynolds, Alcoa, and Aluminium, Ltd., are spending tens-of-millions to develop these deposits. Reynolds has already shipped its first load of ore. Kaiser hopes to start shipping at a 1-million-ton annual rate by fall.

To get some idea of the magnitude of 350-million tons of bauxite, relate this figure to the U. S. consumption last year of about 4.7-million tons.

Communist termites, at work in the Caribbean, have called attention to the invasion of Jamaica by "capitalistic imperialists." Perhaps the Communists had better fire their propaganda strategist for that area, because calling attention to the Jamaica bauxite operations is also focusing attention on an area where dynamic industrialism is doing an outstanding job. Here we see living standards being raised, unskilled agrarian workers being trained to operate modern productive equipment, an island economy being bolstered without sacrificing any of its vital resources, and a limited food supply being augmented by the best agricultural sciences that the mining companies can marshal to produce additional herds and crops.

These developments are no secret. Any visitor to Jamaica can see them, even as they are portrayed on the next six pages. Perhaps it would be downright sporting of the Communists to invite a journalist to visit one of their Utopian operations behind the Iron Curtain and come up with a story matching the good work being done at Jamaica by the "capitalistic imperialists."

Havana was all excited about a new copper strike exposed unexpectedly by mechanical equipment some miles east of the city.

Jamaican news reports state that a St. Andrews investor has been granted a prospector's license to explore iron, manganese, and titanium in an 8-sq.-mi. area in Manchester. Recent geological surveys confirmed the existence of commercial iron ore. Five thousand tons has been approved for trial shipment to Germany.

THE BAUXITE IS MINED . . . from scattered pockets like this in the Jamaica hills,

DRIED . . . in this new two-kiln drying and nodulizing plant,

Reynolds Jamaica Bauxite Project

ALVIN W. KNOERR
Associate Editor

JUNE 5, 1952 is an important date in mining history for it marks the departure to the United States of the first shipload of bauxite from Reynolds Jamaica Mines, Ltd. That shipload is probably as significant to the aluminum industry as the first load of iron ore to leave the Mesabi was to the iron and steel industry. Here in the West Indies, principally in Jamaica, and also in Haiti and Santo Domingo, are high-grade bauxite reserves totaling some 350-million tons[1]—all vitally important to the world's fast-growing aluminum industry.

This date is also significant because it shows how amazingly fast modern mining projects of huge scope can get under way. Only 10 years ago commercial bauxite was first recognized on Jamaica (see Historical Benchmarks), and today, with exploration, development, and plant construction largely completed, Reynolds has already set in motion a $17.5-million project with initial production goal of 750,000 tons of bauxite per year—to be boosted if required.

To Jamaica June 5 is also an important date. It marks the departure of a cargo of an aluminum-bearing subsoil which is quite valueless as a crop nutrient. Nor could this bauxite become the basis of a domestic aluminum industry, because that would require vast quantities of cheap power, and this could not be produced by any economic method feasible today. In exchange for this material, however, the island may look forward to increased prosperity, and much improved living standards for many of the citizens. In return for scattered pockets of bauxite, Jamaica will broaden her eco-

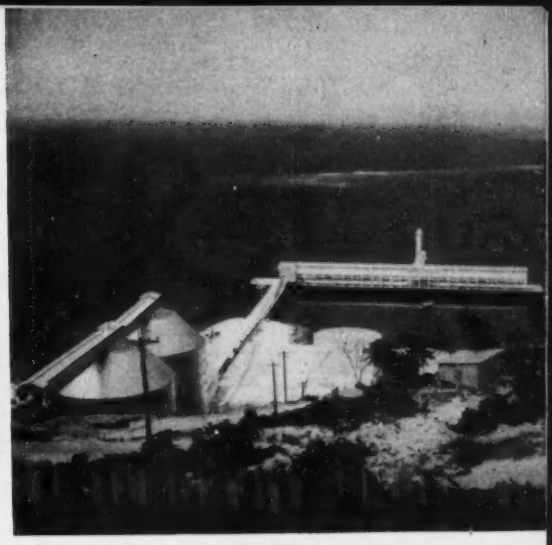
[1] For a complete resumé of Caribbean bauxite information, the reader is referred to: "Caribbean Aluminum Ores," by O. C. Schmedeman, *E&MJ*, June 1948, and "First Caribbean Bauxite Development," by O. C. Schmedeman, *E&MJ* November 1950.

RICHARD S. REYNOLDS, JR., Chairman of Board, Reynolds Jamaica Mines.

WALTER L. RICE, President Reynolds Jamaica Mines, Ltd.

WILLIAM S. COLE, JR., Resident Manager, Reynolds Jamaica Mines, Ltd.

TRANSPORTED OVERLAND . . .
on this 6-mi. aerial tram carrying 1-ton buckets,



AND SHIPPED TO THE U.S.
from this modern dock installation at Ocho Rios Bay.

Ships First Load of Ore to U.S.

nomic base—and in the bargain, the pockets of bauxite will be resoiled and restored to cropland as they are mined out.

From mine to ship, Reynolds is a huge materials handling project (see flowsheet) in which shovels, trucks, conveyor belts, and aerial tramway have to be coordinated to maintain a steady flow of ore to the storage tanks at the dock at Ocho Rios Bay on the north shore of Jamaica.

The ore occurs as a deep red, clay-like dust in scattered basins or pockets in limestone. It is believed that the bauxite residue was derived from high-purity limestones running 99% $CaCO_3$, 0.15% Al_2O_3, traces to 0.02% SiO_2. Tonnage in the pockets varies from 15,000 to 13-million. Thickness averages about 25 ft., but it is known to reach 114 ft. in some places. Since the ore actually occurs at the grassroots, stripping is no problem. The 6-in. layer supporting growth is scraped off and set aside for resoiling as the individual pockets are mined out.

Two types of ore encountered are as follows:

Typical Ore Analyses

	Trihydrate	Monohydrate
Al_2O_3	49%	50%
Fe_2O_3	19%	20%
TiO_2	2%	2%
SiO_2	3%	3%
Ignition Loss	27%	25%

The monohydrate and trihydrate ores occur separately and have to be mined separately because the process of treating the two ores differs. The monohydrate type will go to Corpus Christi for treatment, and the trihydrate to the Hurricane Creek plant.

Mining in Jamaica is principally an earth-moving job, with trucks and shovels playing the major part. Virtually no blasting for ore is required. In addition, tractors and scrapers are used in development work, road building and maintenance, stripping, and resoiling. Because of the scattered nature of the deposits, building good roads is important.

After the ore has been trucked to a centrally-located receiving hopper, it is transferred by conveyor belt to a stockpile which feeds the drying plant. In natural state, the bauxite contains about 22% water, 80% of which is driven off in the drying process. The chief problem in the drying plant is to avoid excessive temperatures which might calcine the ore too much, thus resulting in lower metallurgical recovery in the United States. High temperatures drive off too much water of hydration. Ideal bauxite discharge temperature is about 200 deg. Pelletizing and drying results achieved

(Continued on p. 112)

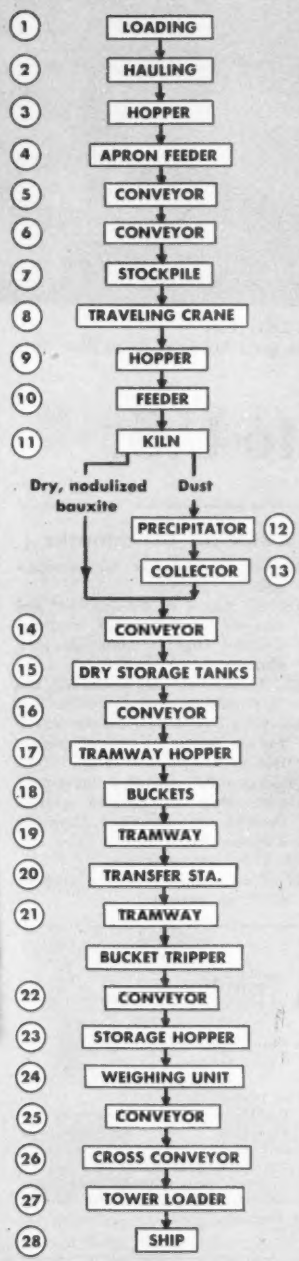
Historical Benchmarks

1863—Sawkins reports high-alumina soils in Jamaica.
1942—Sir Alfred H. D'Costa sent soil sample to London for analysis. Learned that it contained 50% alumina.
1942—Aluminium, Ltd., of Canada, and N. V. Billiton start search for ore.
1944—Reynolds Metals starts search for ore and acquisition of properties.
1950—Reynolds concludes agreement with ECA to develop project through new subsidiary, Reynolds Jamaica Mines, Ltd.
1950—Construction starts.
1952—First shipment of ore goes to U. S. on June 5.

A Tribute

The story presented here constitutes a fitting tribute to the late Dr. O. C. Schmedeman, geologist for the Reynolds Metals Co., for it was he who first examined the amazing bauxite area, recognized its importance, and recommended this vital Jamaican mining project now coming into fruition.

MATERIALS HANDLING FLOWSHEET
REYNOLDS JAMAICA MINES, LTD.



LEGEND

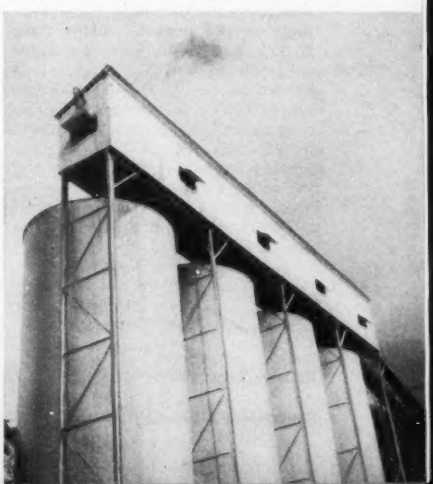
1. Loading Equipment at Mine. Two Marion 111-M 4-yd. shovels; one 362-M 1½-yd. shovel; one 93-M 2½-yd. shovel; five D-8 tractors with scrapers.
2. Haulage. Eight 14-yd. bottom-dump Euclid trucks with G.M. diesel engines.
3. Hopper. Capacity, 78 cu. yd.
4. Apron Feeder. Hewitt Robins. Capacity 750 t.p.h.
5. Conveyor. Hewitt Robins. 42 in. x 1010 ft. long.
6. Conveyor. Hewitt Robins. 42 in. x 1100 ft. long. Slope varies from plus 5 deg. at tail end to —20 deg. along the line. System is controlled by GE 1600-lb. Thrustor brake.
7. Stockpile. Capacity approx. 12,000 tons.
8. Traveling Crane. P&H, 13½-ton, 5-ton grab bucket.
9. Hopper. Capacity, 15 cu. yd.
10. Feeder. Traylor, rotary table with blade.
11. Kiln. Two Traylor 9 x 175-ft. Capacity 40 to 100 tons per hr. Present operating rate 75 tons per hr.
12. Precipitator. Research Corp. Cottrell.
13. Fuller-Kinyon Airslide transfer unit.
14. Conveyor. Hewitt Robins. 24 in. x 379 ft. long.
15. Four Tanks. Total capacity about 2500 tons.
16. Conveyor. Hewitt Robins. 24 in. x 210 ft.
17. Tramway Receiving Hopper. Capacity 100 tons.
18. Tramway Bucket. 330 1-ton buckets in line.
19. Upper Tramway Section. 5 mi. long. Designed by Ropeways, Ltd., London. Capacity 125 long tons per hr. Speed 150 yd. per min. Drive at head station powered by 100-hp. English Electric motor, 440-v., synchronous motor with speed reducer.
20. Transfer Station. Second drive for lower section of tramway powered by English Electric 60-hp. synchronous motor and speed reducer.
21. Tramway. Lower section 1 mile long.
22. Conveyor. Hewitt-Robins 24-in. x 450 ft. long.
23. Storage Hopper. Two, capacity 12,500 tons each.
24. Weighing Unit. Made by Dennison Company, England.
25. Conveyor. Drag Scraper & Engineering Co., London. 48-in. x 1,000 ft. long.
26. Cross Conveyor to Loading Tower. Drag Scraper & Engineering Co. 48-in. x 300 ft. long.
27. Tower Loader. Drag Scraper & Engineering Co. with 48-in. x 50-ft. belt. Maximum capacity 1800 tons per hr.
28. Ship. The "Carl Schmedeman.", capacity 13,400 tons. Loading time, 8 hr.; unloading time, 8 hr.; round trip time to Mobile, Ala., 8½ days. Designed to carry fuel oil for kilns on return trip. Other ships will be used also.

FLEET OF EIGHT EUCLID TRUCKS (2)

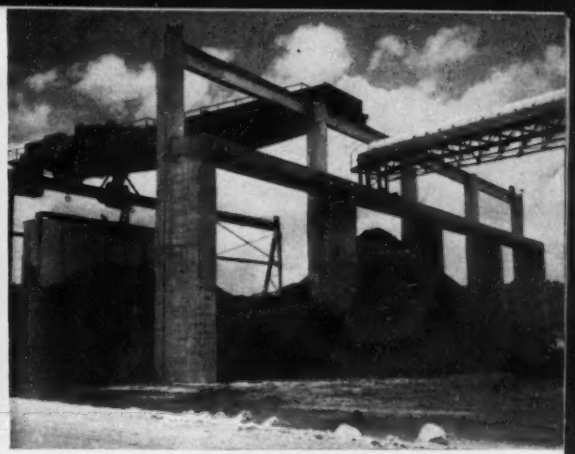
Note: No.'s in captions refer to Flowsheet.

COTTRELL PRECIPITATOR (12) removes dust. Note clear stack discharge.

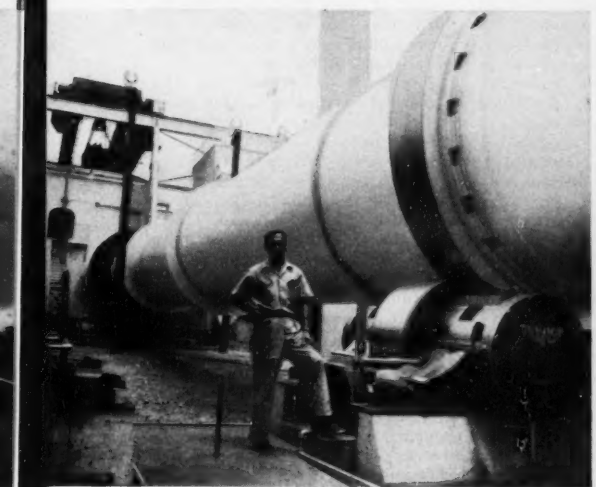
STORAGE TANKS (14) for tramway.



CONVEYOR BELT (5) transports bauxite to stockpile. Al Keeling, public relations superintendent, at right.



STOCKPILE (7) feeds drying plant. P&H 13½-ton crane with 5-ton bucket (8) moves bauxite to kiln feeder (10).

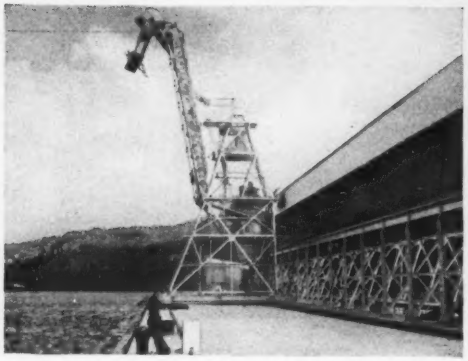


DAVID MATHIAS, drying plant superintendent, explains purposes of drying and nodulizing kilns (11).

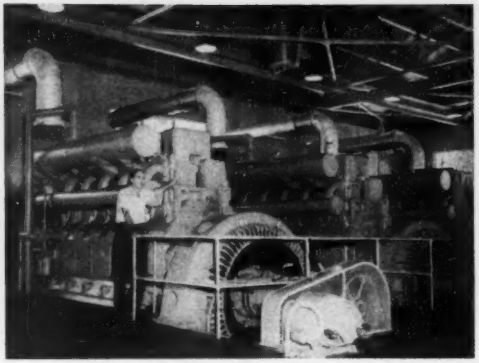
TRAMWAY BUCKETS (18) are loaded in this building and started on their 6-mi. trip to Ocho Rios.

TRANSFER STATION (19) to lower tramway section.

BUCKET TRIPPER (21) at end of 6-mi. tramway.



TOWER UNLOADER (27) at the modern dock installation at Ocho Rios sends the bauxite on its way to the U.S.A.



W. DELNEGRO, power plant foreman, explains operations of the modern Nordberg-GE diesel-electric power plant.

to date are equivalent to those achieved in laboratory tests.

Capacity of the drying plant, consisting chiefly of two oil-fired 9x175-ft. Traylor kilns, is 125 to 160 tons per hour. Present output of the drying plant is 15,000 to 20,000 tons per week running seven days, three shifts.

Automatic controls at the furnace end of the kiln regulate air draft, ore temperature, gas temperature, steam pressure to heat the fuel oil, kiln revolution speed, and oil flow. A Coen oil pumping and heating system preheats the fuel oil to 200 to 250 deg. F. Automatic dampers are controlled by a Leeds-Northrup unit. Draft is produced by two Buffalo Forge induced draft fans with water-cooled bearings. The fireman on shift controls all kiln operations.

Another problem at the drying plant is dust. The operators see to it that no dust or smoke emerges from the plant stack. This is accomplished by automatic controls and a Cottrell dust collecting system at the feed end of the kiln. A Fuller-Kinyon Airslide unit transfers the collected dust from the kiln exhaust section to the conveyor carrying the dry ore out of the plant.

To visitors, the most spectacular installation on the property is the 6-mi. aerial tramway which carries ore from drying plant discharge bins to the dock at Ocho Rios Bay. Tram cables, supporting some 330 buckets of 1-ton capacity, skip across the hilly countryside from tower to tower ranging from 13 to 130 ft. in height, and constructed at points ranging from 1,100 to 1,950 ft. in elevation, dropping down to sea level at the bay. Number of towers is 122. The tramway was designed and built by Ropeways, Ltd., London, and installed by Frederick Snare Corp., which had the major construction contract for the whole project.

The rope is 1½ in., 6x7, lang-lay, right-lay, improved plow steel. The tram is built in two sections—a 5-mi. division starting at the drying plant, and a 1-mi. section carrying the line to the dock. The drive for the 5-mi. section is powered by a 100-hp. 440-v. motor, and that for the 1-mi. section by a 60-hp. 44-v. motor. At the transfer point connecting these two sections, the buckets (loaded and empty) are automatically transferred from one section to the other. Fifteen-ton concrete counterweights are installed at the lower end of each section to maintain proper tension in the cables. In the lower (1-mi.) section, the downhill trip involves a certain amount of braking, and this is done electrically.

The Ocho Rios port is sturdily designed to handle bauxite for many years to come. Once the bauxite leaves the two 12,500-ton storage bins at the tramway terminal, it travels smoothly by belt over a weighing device, then to a cross-conveyor belt, and finally to a belt-equipped loading tower.

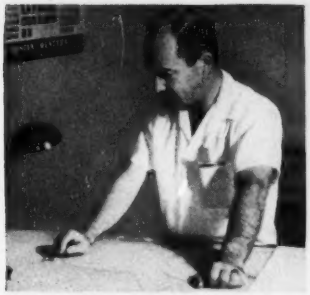
A new ore ship, "The Carl Schmedeman," has just been launched for Reynolds at Barrow-in-Furness, England. Capacity will be about 13,400 tons, and its loading time is estimated at about 8 hours. This novel ship is self-unloading, being equipped with conveyor belts which will carry the ore to the stern of the ship, thence to a conveyor discharging on shore. Estimated unloading time is 8 hours. The ship is also designed to carry fuel oil on the return trip. This is pumped to the drying plant over a 6-mi. pipe line paralleling the tramway.

Power is generated for the project at a centrally-located plant equipped with three 525-kw. diesel-electric units and one 840-kw. unit. Engines are Nordberg, and generators, GE. Power is generated at 4,160 v. and supplied to operating equipment at 440-v., and 110-v. for lighting. Power is transmitted to the Ocho Rios dock installation at 13,000 v. Transmission lines are all aluminum, and the diesel power plant features a cooling system by Trane, equipped with all-aluminum radiators.

In keeping with the Reynolds policy of "putting more back into Jamaica than is taken out," the company is now engaged in extensive agricultural projects. Of the 50,000 acres held by the company, about 10% will be opened up for mining. Eventually this will be restored for agricultural and other purposes, along with the remaining acreage. Under the able direction of Keith Coxe, manager of farm operations, the company has built up a fine herd of 7,000 cattle consisting of Red Poll, Black Poll, and Herefords which have been crossed with the Brahman strain. Cattle generally deteriorate in Jamaica unless crossed with the Brahman type. Hence five Brahman bulls have been imported from the U. S. including one prize bull worth $3,500. A small herd of Santa Gertrudes cattle has also been imported from the U. S.

Meat production which is sold for very low nominal prices for island consumption has jumped from 98,985 lb. in 1950 to an estimated 400,000 lb. for 1952.

A Few of Reynolds' Hard-Working Staff Members



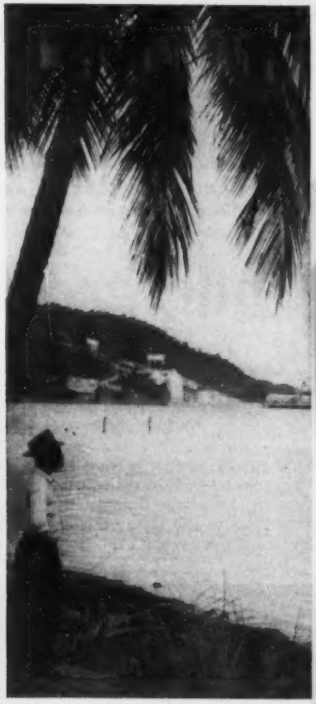
DICK WILLIAMS
Superintendent of Operations

CAPT. R. FOSTER
Port Superintendent

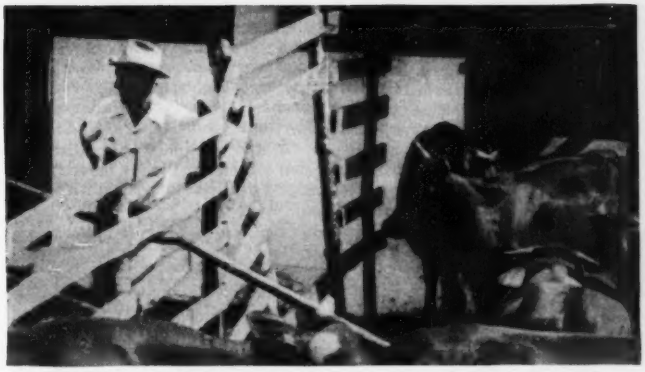
VINCENT HILL
Chief Chemist

W. R. McDANIEL
Mining Superintendent

ROLAND WILLIAMS
Shop Foreman



"JIMMY," company chauffeur, whom most visitors (including *E&MJ*'s) regard as "Tops." Full name is James Clemetson.

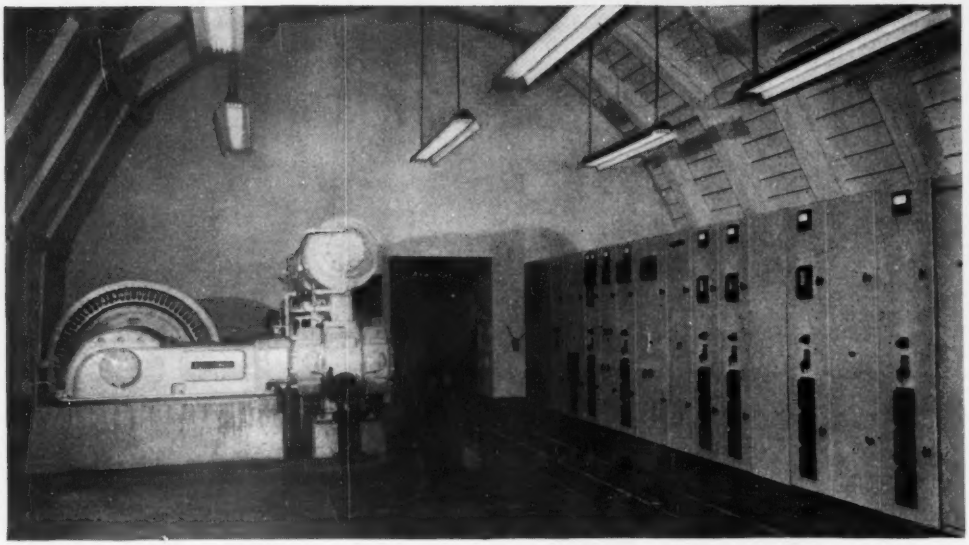


KEITH COXE, capable and enthusiastic manager of farm operations, shows off some of the fine herds that Reynolds Jamaica is developing to augment island meat supply.

Employees engaged in farming activities of the company total about 646, some of whom are part-time workers. Reynolds provides free land for about 846 small-farm tenants who raise their own corn, beans, yams, potatoes, etc. These tenants move every 2½ years to prevent soil depletion. In some instances, Reynolds even does free plowing for these tenants.

One thing very much in evidence at the Jamaica project is the patience and hard work required of staff members and supervisors in training men and smoothing out the performance of new equipment. Among them are Al Butterfield, mechanical superintendent, Rudolph Jobson, personnel superintendent, and James Hartman, geologist, whose pictures are not included in the random shots shown above.

E&MJ thanks William S. Cole, resident manager of the Jamaican project, and his capable staff for information presented here. Special thanks are due Alastair Keeling, public relations superintendent, for his help in compiling the facts presented, and to Irving Lipkowitz, assistant to the president of Reynolds Metals Co., for background information used in the preparation of this article.



THIS 500-KVA POWER CENTER was installed in Silver Summit Mining Co.'s top level station as part of company's program to improve its power distribution system underground. At left of picture is a 2300-v. compressor.

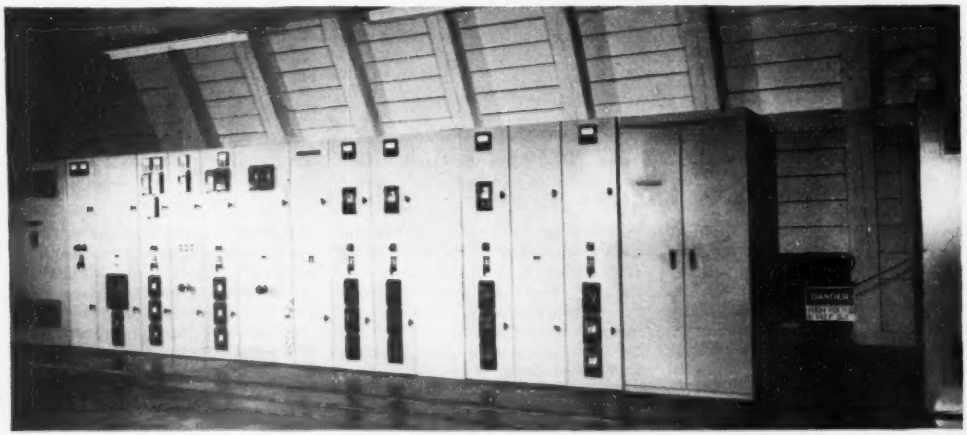
Underground Power Centers End

R. M. GILBERT
Engineering & Service Div.
Westinghouse Electric Corp.
Spokane, Wash.

H. A. SCHEIDEMAN
Chief Electrician
Silver Summit Mining Co.
Osburn, Idaho

NEW POWER DEMANDS were created when new orebodies were discovered deep in the Silver Summit mining properties in the Coeur d'Alenes in Idaho. As a result the existing underground distribution system soon became inadequate with respect to both thermal and voltage regulation. In late 1948, steps were taken to relieve the shortage of power underground. An increase in electrical capacity was planned and provisions made for further expansion later, if necessary, even though the extent of still unexplored ore-bearing property was unknown at the time.

A study of the 2,400-v. distribution system was made before redesigning it. Several possibilities were



POWER CENTER is 5600 ft. from entrance. Behind "danger" sign are batteries controlling air-circuit breakers.

TOP LEVEL STATION, shown here and in adjacent pictures, occupies room cut in rock 35 ft. wide and 90 ft. long. The station is well lighted.

Mine Power Shortage

considered with respect to initial investment, thermal capacity, interrupting capacity of switchgear, voltage regulation, power losses, installation cost, and emergency operation. Distribution voltages of 2,400, 4,160, 6,900, and 13,200-v. were studied. A factor that strongly influenced the ultimate decision was the long distance underground (5,600 ft.) between the tunnel portal and the first underground station where equipment for transforming voltage could be installed.

Size of Electrical Equipment a Factor

In choosing the electrical components for any system, other factors had to be considered, such as maintenance, high humidity, emergency operation in the event of cable failure, standardization of power transformer capacities, and physical size of equipment. Electrical apparatus had to be small enough to clear the tunnel walls and permit lowering down vertical shafts to levels where it was needed. Shaft dimensions were 66 in. in one direction and 44 in. between guide rails in the other. The tunnel measured 6 ft. 5 in. from rail top to overhead trolley wire and was about 4 ft. 10 in. wide where it passed through timbered faults. A special car and skip was designed to facilitate the transportation of electrical equipment through tunnel and shaft respectively.

The switchgear units selected were made with removable swinging front panels to reduce their dimensions a few inches. As these arrived, they were carried one by one into the tunnel in the order of what was to be their final line-up. Electrical crews of the mine connected up each unit as it was moved in, since standardized metal-clad switchgear was used. Each unit was complete in itself, with standard facilities for interconnecting the primary and secondary wiring.

Major elements of the electrical system of the mine that are now in operation include two installations of switchgear at the tunnel portal, and an underground power center with distribution feeders running to various underground load centers. One of the switchgear groups at the portal feeds power at 13,200-v. through a three-conductor, lead-shielded, No. 2 AWG varnished cambric main power cable to the top level station, where the power center and main hoists and compressors are situated. Besides this main substation, there is a 2,400-v. switchgear installation to provide power to the mine in case of emergency.

The station at the top level contains a double-ended substation with two 500-kva., 60-cycle, 13,200/2,400-v. ASL dry-type transformers. Close-coupled to these are a total of 14 switchgear units. Components include main transformer breakers, feeder breakers, reduced-voltage and line-start motor-starting equipment, metering and complete instrumentation. Tie breaker equipment ties the emergency line from the tunnel portal to the 2,400-v. secondary of the substation. All electrical equipment at the top level station, including main hoists and compressors, is controlled by the substation mentioned, and 2,400-v. distribution feeders from it run to various parts of the mine to handle the load as required.

Top Station Well Lighted

Cut in the solid rock 5,600 ft. from the portal, the top level station is 35 ft. wide and 90 ft. long. Designed by R. W. Neyman, general manager of the Hecla Mining Co., and built under the supervision of Bill Love, the walls and ceilings of the room are supported and strengthened by heavy wooden timbers arranged in dome-shaped configuration.

Fluorescent lighting and paint of light color on the semicircular ceiling provide good illumination for any maintenance work needed. Switchgear units can be inspected by using the drawout feature of the modern gear. The system of dynamic coloring used in the room reduces eye strain and increases safety. Timbers are colored light green, the cement floor is red, and the compressor buff. Compressor air pipes are black; water pipes, yellow; oil lines, chartreuse; and electrical cable conduits, a Chinese blue.

When the Silver Summit installation is complete, another substation similar to that at the top level station will be provided at the No. 2 winze station 3,000 ft. below the top level. It will control a 500-hp. hoist, not yet installed, and will provide two additional 2,400-v. feeders for lower levels. Power will be supplied at 13.2 kv by another main power cable, tied to the primary of the top level substation and running down the vertical shaft. A load break disconnect switch will be used to isolate the 13,200-v. line going down the vertical shaft.

KEEPING TAB ON PRACTICE

SCROLL-TYPE AUGER of this mobile, flexible unit brings cuttings out of hole to determine character of ground.

IN DRILLING with this auger-type machine, a fairly accurate log of hole may be taken up to about 50 ft.

A supplement to diamond core drilling is found in Small-Diameter Long-Hole Rotary Drilling with Carbide Bits

RYAN McNAMEE
Mine Superintendent
U. S. Gypsum Co., Plasterco, Va.

U. S. Gypsum Co.'s operation at Plasterco, Va. is an underground mine which produces gypsum for making plaster, wallboard, partition tile and related products. From a 735-ft. vertical shaft nine levels have been opened, the lower four of which are in production at present.

The deposit consists of irregularly distributed blocks of gypsum in a zone of dry, incompetent clays and crushed shales. The blocks were formed when the original beds were involved in an overthrust of major proportions. The clays which comprise the larger part of the gypsum-bearing zone are well illustrated by their local name of "dirt." The gypsum blocks are called "boulders" and vary from a few tons to many thousands of tons. They have no pattern of occurrence, so diamond drilling is employed to discover them.

THE EXPLORATORY diamond drilling at Plasterco leaves considerable sections of ground untested where smaller boulders of gypsum may occur. For this reason, a method of testing these sections quickly and with fair accuracy had to be developed. This was found in the use of a mobile flexible unit, with which the character of the ground is determined from cuttings brought out of the hole by a scroll-type auger.

Maximum depth of hole possible with this rig has not yet been determined nor have all its uses been explored. The possibility of using it in long-hole drilling appears to be worth investigating due to short "set-up" time required and speed of drilling in ground where it can be used.

This unit is a Gardner-Denver UMC drill wagon with an RM motor feed, the augers being turned by an MEGP 6-hp. air motor with a spindle speed of 200 rpm. The mining tool division of Kennametal Inc., at Bedford, Pa. developed the drill tool assembly. This is a string of scroll-type augers, 1¾ in. in diameter by 6 ft. long. The augers are hollow tubing with a welded scroll and a ⅞ in.-8 Acme female thread in each end. The string is coupled together by double-ended male studs 3¾ in. long drilled lengthwise with a ¼-in. hole

Drill bits are Kennametal two-prong type RDDC 1⅞ in. and the diamond-shaped type HFDD 1⅞ in. The latter is used as a starter only. After experiment, inserts of K9 grade were selected. Bits average 300 ft. per grind, with an average total life of 1500 ft.

Mobile and Flexible

This unit with a two-man crew can be moved quickly to any part of the mine, set up in a limited space in a short period of time, and drill

test holes 50 to 100 ft. long in any direction desired. There is no set pattern. These auger holes can be drilled radially from a drill station, stope, or "wide spot" in the drift, as a series of parallel holes along a development heading, or as vertical or inclined holes, either up or down, to locate any gypsum which might be present or outline any boulder of gypsum being opened.

About one-third of the holes drilled with this unit are vertical down holes and two to three such holes 50 ft. long can be drilled per shift. The rest of the holes range from this direction to vertically upward.

Cleaning is a problem only in holes that are straight down or nearly so. In up-holes, horizontal holes and down-holes to about 60 deg. from the horizontal, cleaning is easily done.

Speed vs. Direction

Holes slightly above horizontal drill fastest—up to 6 fpm—because the auger weight lies against the side of the hole and the cuttings feed out rapidly. Holes drilled vertically up or nearly so are drilled more slowly as the machine has the auger string to feed against in addition to forcing the bit into the rock. Drilling vertically down or nearly so is slowest due to the tendency of the fine powdery cuttings to pack. An auger with a small depth of scroll will feed these cuttings out, whereas an auger with a deep scroll will tend to "freeze."

A fairly accurate log of one of these holes can be kept up to about 50 ft. Beyond that, considerable mixing of the cuttings takes place. However, even in this section (50 to 100 ft.) the presence and general extent of gypsum can be determined approximately.

MALE STUD, 3¾ in. long and drilled lengthwise with ¼ in. hole, is used to connect augers.

Some Modification

In developing this type of drilling, we found that the spindle speed of the drill motor has to be increased from the original 50 to the present 200 rpm to feed the cuttings out of the hole freely. Also the original rigid chuck coupling was replaced by a flexible coupling so that deflection of the drill by varying position of the drill motor would not force augers out of line.

Original auger couplings were of the snap-button type. These were unsatisfactory. Cuttings would pack around the snap-buttons and release them. Also, this type of coupling made the auger string quite flexible, resulting in crooked holes. The threaded connection was then developed.

Cleaning Speeded

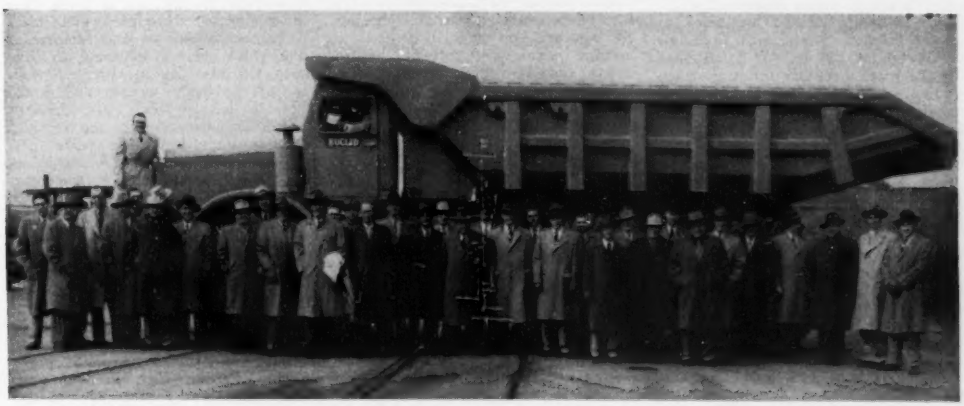
The hollow augers and hollow connectors allow air to be shot through the string of tools at each auger change, fluffing up the cuttings for faster cleaning. Interruption of the auger scroll at each coupling breaks up any balling-up of the cuttings, something the snap-button auger with its continuous scroll would not do.

The diamond-shaped bit has been found more satisfactory as a starter against face irregularities than the two-pronged bit. The collaring device is a must in starting the hole but the scroll-type auger had a tendency to catch on the device even with a bell-mouthed liner. For this reason, a starter rod was made from a section of core drill rod threaded to fit the drill chuck stud on one end and with a short section of auger welded on the other end. This with the diamond-shaped bit, drills a starter hole 6 to 8 in. deep, using the collaring device. It is then taken off and the lead scroll auger with a two-pronged bit is started without the collaring device.

When the auger has drilled its length, the drill is stopped, a pipe wrench placed on the auger and fouled against the drill wagon, and the drill motor reversed and unscrewed from the auger. The next 6-ft. auger section is coupled to the face auger by hand, lined up with the drill chuck stud, and the rotation of the machine tightens the connection.

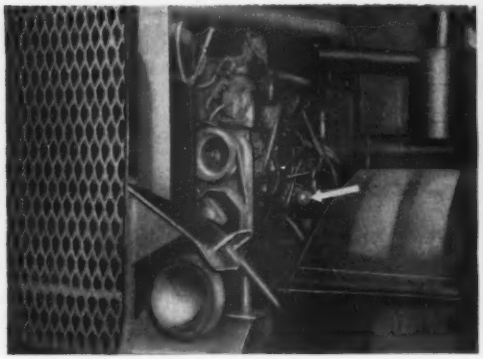
This rig has proved so successful as a supplement to our diamond core drilling, that we now have another ready for use, this latter with a 10-hp. motor at 200 rpm. The extra horsepower should give sufficient additional torque so that high rpm necessary to good hole-cleaning can be maintained in holes even deeper than those drilled to date. It is planned to put a swivel connection on the drill chuck so that a low volume of air can be kept blowing through the auger string while drilling.

(Please turn to p. 118)



How big is this off-highway, rear-dump truck?

ITS HUGE SIZE can be appreciated, as Euclid's largest heavy-duty truck serves as background for group of company representatives. With payload capacity of 100,000 lb. and weight empty of 110,000 lb., truck is 36 ft. 5 in. long overall, and 13 ft. 9 in. wide. Body is 22 ft. 6 in. long, 11 ft. 11 in. high. Two engines provide a 600-hp. power plant.



WITH AIR STARTING, a cold engine can be hooked to shop air and turned over as long as necessary.

AIR RECEIVERS can be filled from shop supply when truck is down too long and loses its air pressure.

Air-Starting Cuts Cost of Electrical Maintenance on Mesabi Operator's Off-Highway Trucks

AFTER PROLONGED FIELD TESTS, one of the open-pit operators on the Mesabi Range is turning to air-starting motors for its 20 and 30-ton trucks. At the close of 1951, it had 19 heavy-duty trucks equipped with air starters in operation and another 40 on order. Experience to date indicates that adoption of the starters will cut electrical maintenance costs about 70%. Other advantages are: Improved starting in cold weather, greater ease in shop and field servicing, and simplification of electrical systems.

In making this application, engineers of the Ingersoll-Rand and Euclid Road Machinery companies have cooperated with the mining company. The first step was taken late in 1949 when a 9BM I-R air-starting motor was installed on the 300-hp. NHRS-600 Cummins diesel engine of a 22-ton rear-dump Euclid. This vane-type motor develops 7 hp. with 75-lb. air to 16 hp. at 150 lb. Air is supplied by the truck's regular air brake compressor to an 11-cu. ft. auxiliary receiver. Capacity is ample for the starting system, keeping the receiver at 150 psi.

Later a 20BM motor was used to crank a 400-hp. diesel on a 34-ton truck. This motor produces 19 hp. at 75 psi to 41 hp. at 150 psi.

For two years the test units withstood rough service, cranking diesels under Northern Minnesota's difficult climate, with small expense for starter maintenance. Then the company installed at one mine eight 34-ton rear-dump trucks, each with two 9BM air motors to crank the twin 200-hp. Cummins diesels. A little later at another mine, a new fleet of 34-ton Euclids was put into service with twin 200-hp. Model 6-71 GMC diesels, each with a 9BM starter. Receiver size has been reduced to 9 cu. ft., since this had proved adequate for the normal work schedule.. The 40 additional trucks with air starters were on order.

Air-starting is said to have removed many of the troubles had with electrical starting systems. It has permitted replacement of the complicated and expensive 12 and 24-v. electrical systems with the simpler, more economical 6-v. systems. The 12-24-v. battery was essential for electric starting, but with air starting the reduced electrical requirements can easily be met by the generator which produces 75 amp. at idling speed. The comparatively cheap 6-v. battery is in the line only as an accumulator and standby.

The 12-24-v. equipment required much expensive maintenance, involving parts and labor and taking trucks out of service. The 12-v. headlight bulbs are fragile and 1,200 sealed-beam units had to be replaced on 170 trucks in one six-month period. The 6-v. bulbs are stronger and cheaper. Savings are also made in generators, voltage regulators, batteries, fuses, cables and other items. Cost of electrical maintenance on air-cranked vehicles has been cut about 70%, as stated at the outset.

Brake Compressor Supplies Air for Starting

It has been easy to provide the necessary air for cranking under the conditions met. The trucks operate continuously, stopping only for shift changes, lunch hour, and maintenance. This involves six starts a day on the average. On this schedule, the brake compressor easily keeps the receiver supplied. If a truck is parked in the garage long enough to lose its air, the tank is pumped up by the stationary compressor through an outside fitting on the receiver. If repeated stalls cause a truck to exhaust its air supply, another truck is run alongside and the air tank pumped up.

By contrast, if the battery of an electrically-cranked truck runs down, a replacement must be put in and the old battery charged. The 24-v. batteries used weigh about 100 lb. and are located 8 ft. above the ground. To replace one is not easy.

Cold weather starting is a problem where temperatures fall far below zero. Experience has shown that after a truck has been parked overnight at 20 below, the diesels should not be turned over until warmed. Forcing an engine would just tear it up. Even after a torch has been put to the pan, the engine may be hard to start. In such cases, it is easy to connect the truck to the air and turn the engine over as long as necessary. Compressed-air power is not affected by the low temperature in the field, whereas batteries are lowest in cold weather.

Use of shop air to turn an engine over is also convenient.

The receiver on these trucks is mounted on the frame, on the right side under the cab. Air is taken from the compressor through flexible hose. A tee connection at the compressor and check valves in each air line keep the starting system independent of the brake system and guard against loss of brake air. Another length of hose connects the receiver through a quick-opening valve to a globe valve in the cab. A third section runs from the valve to the starting motor.

The motor itself is compact, rugged and simple. Five vanes of special phenolic material seat in slots in a hardened steel rotor which turns in a hardened-alloy cylinder. The rotor is supported by ball bearings mounted in bronze end plates. Dowels assure perfect alignment. Compressed air enters and leaves through ports in the cylinder. Any mechanic can disassemble and reassemble easily. The first test units were grease-lubricated and had neither air strainer nor lubricator. No vanes or cylinders have needed replacement in two years of service, so it has been concluded that lubricators and strainers are not necessary.

ELECTRIC TRACTOR replaces familiar diesel-powered front end on 12-ton semi-trailer unit. Its speed is rated at 8.5 to 21.5 mph.

This Tractor-Trailer Is Electric-Powered

A MEANS OF TRANSPORT that will be a novelty to most open-pit operators is being used in a limestone quarry in northeastern France. The broken rock is loaded by a shovel into tractor-trailers consisting each of a 12-ton Easton side-dumping body hauled by a Vetra electric trolley tractor. This unusual type of tractor-trailer is shown in the picture above.

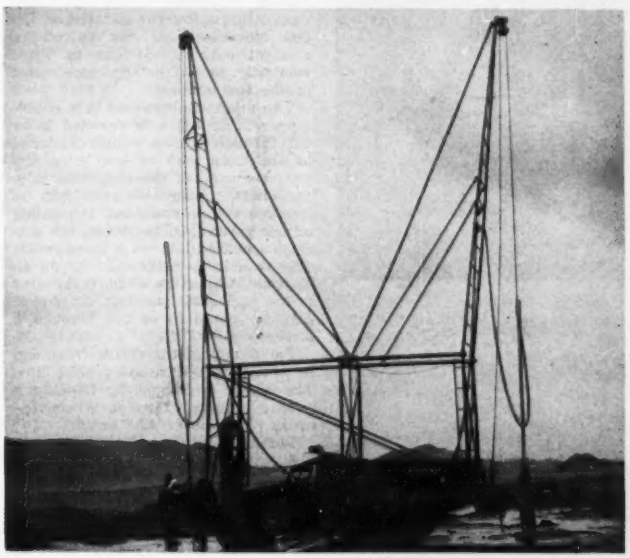
The transport system is adapted to the shape of the pit. This is relatively narrow, the working face being an amphitheatre of small dimensions. Distance to the crushing and screening plant is six-tenths of a mile.

The electric tractor takes 600v. dc power from an overhead two-wire system. The poles are portable and the semicircle they form at the face, as the trolley line turns back toward the plant, can be moved ahead as the face advances. This has to be done about once a year.

Current is taken from the two-wire overhead line by a six-wheel trolley. Pressure of wheel against wire is maintained by a plastic device. The trolley cannot jump off. Connection is made to the tractor by a flexible two-wire cable paid out against a spring. This lets the tractor run about 30 ft. from the center line of contact. An alarm sounds when only 3 ft. of cable remains.

The tractor will pull a semi-trailer of 14 tons total weight and at 8.5 to 21.5 mph. It has a direct-connected compound-wound motor. Both rheostatic and regenerative braking are used, supplemented by a Westinghouse air brake and a hand brake.

The quarry is known as Villey Saint Etienne. Easton Car & Construction Co. furnished the body. The Vetra tractor is made by Soc. des Véhicules et Tractors Electriques, of Paris.



RIG FOR DRILLING blast holes through cemented sand layers at Trail Ridge permits two holes to be drilled at a time.

Two 8-in. Holes at Once With Mobile Rig

OCCURRENCE OF LAYERS of cemented or consolidated sand, locally called hard pan, in E. I. duPont de Nemours Co.'s deposit of ilmenite-bearing sands at Starke, Fla. (*E&MJ*, May, 1952, pp. 82-87) necessitated blasting ahead of the suction dredge to speed the latter's operation. To put the holes down for this purpose a special drill rig mounting two drills on a half track has been developed. With it two holes can be drilled simultaneously at 28-ft. intervals in parallel rows.

Each end of the rig is equipped with a 45-ft. mast and an electrically driven capstan. A 40-ft. drill pipe with a 6-in. diameter bladed cutter is supported by a rope passing over the masthead pulley to the capstan. High-pressure water is carried to the top of the pipe by a hose. No hammer or casing is used. Alternate tightening and loosening of the rope, which is wrapped around the capstan head, imparts a chopping action to the cutter blade while water is pumped into the hole.

Sand, loosened by the cutter blade and water jet, is flushed out and leaves an open hole about 8 in. in diameter extending to the bottom of the deposit. The holes are at 28-ft. intervals in rows 20 ft. apart and staggered. They are 20 to 40 ft. deep.

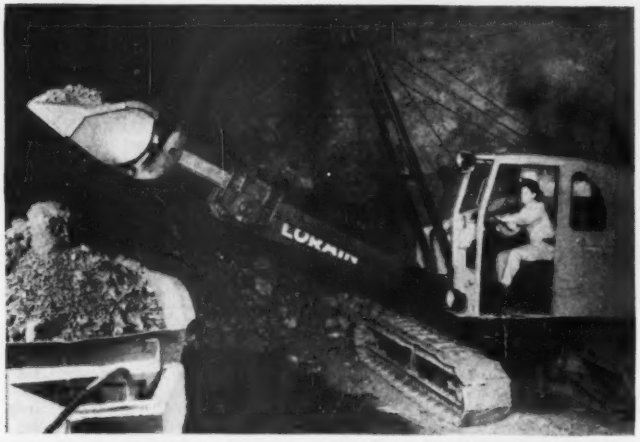
The holes are loaded with Nitramon and detonated with Primacord. Generally four rows of five holes each are shot at a time. At first, millisecond delays were used. Later, better results were obtained when all holes were shot at once. Shots are made up to within 150 ft. of the dredge without damage to the hull.

(Please turn to p. 120)

Big Truck Coming

The Dart Truck Co., of Kansas City, Mo., is known to be working on a big off-highway truck in the 50-ton range. At the present time there are approximately 70 heavy-duty trucks of this manufacturer's make in service on the Mesabi.

Lower Loading Costs Claimed With New Scoop Shovel



NEW-TYPE SCOOP SHOVEL loading in three underground mines. Top, in property of Eagle-Picher Mining & Smelting Co., Tri-State District. Center, in mine of Dominion-Wabana Ore, Ltd., Newfoundland. Bottom, in mine of Black-White Limestone Co., Quincy, Ill.

A NEW TYPE OF SCOOP SHOVEL, developed by Thew Shovel Co., of Lorain, Ohio, for underground loading operations where the output wanted ranges from 100 to 150 tph, has been in service for some time in various mines and is about to be put into full production.

This equipment is known as the Lorain-TL scoop shovel. It is a full-revolving unit. What makes it new is the front-end attachment that may be applied to any basic TL-25 turntable. The attachment is interchangeable with standard shovel, crane, clamshell, dragline and hoe front-end attachments. It consists of a short, rugged boom, 8 ft. 6 in. long, at the front end of which is located a cable-driven shipper shaft which has pinions at its outer ends.

At the properties where the shovel has been working, comprising certain underground limestone, iron, lead and zinc mines, it has been shown to have advantages inherent in its design. Loading costs have been cut because of (1) large dipper capacity, (2) ability to stand in one place and swing the load from face to truck, and (3) decreased maintenance. In one lead-zinc mine this cost has been lowered $45-$50 per 8-hour day, compared with the cost obtained with previous methods.

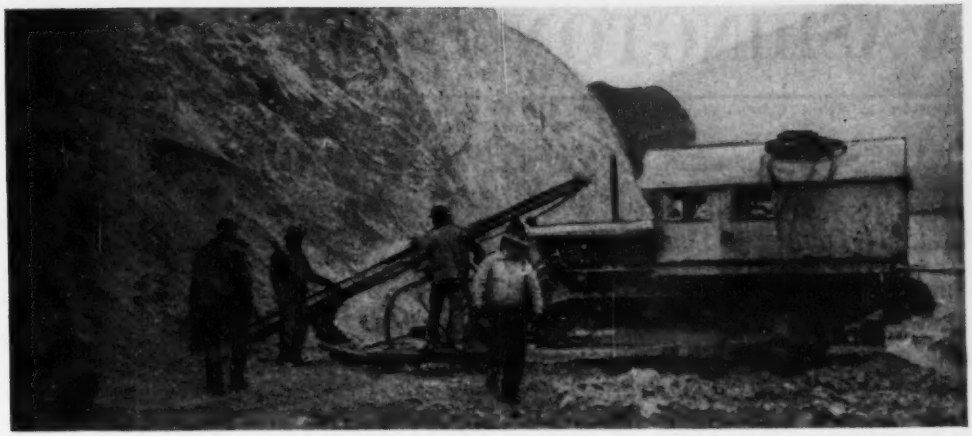
While its action is essentially horizontal skimming, the scoop bucket can be thrust into the material at (1) any elevation and can be pushed straight out, or (2) can be lifted vertically, or (3) in any combination of the two motions.

The dipper is attached to a double dipper stick which is crowded in or out through sleeves rigidly fastened to the outer end of the boom. By proper control of the reversible shipper shaft, dipper and stick may be crowded out or retracted. Depending on the position of the boom, the machine can load (1) on a downgrade; (2) on a level grade; (3) or on an upgrade. When the boom is lowered to the horizontal position, the dipper may be moved in or out through a stroke of 6 to 7 ft.

For dumping, the entire front end is raised by a three-part hoist line. The dipper is dumped by tripping a release actuated through a conveniently placed lever.

The dipper has no teeth. This, coupled with the 6-7 ft. loading stroke, permits the shovel to clean up along the rib and at the face and on the floor in excellent fashion. Loading in rooms and entries sloping downgrade shows better recovery and clean-up than has been possible with standard shovels.

The new shovel can travel through entries 9 ft. 6 in. high and work in head room as low as 10 ft. 6 in. Thus it can work in places in which a conventional-type shipper-shaft mining shovel cannot be used. Generally the shovel uses a 1¼-cu. yd. dipper. This capacity is almost double that of the standard dipper handled by the same model of machine.



DRILL AND COMPRESSOR are combined in this crawler-mounted unit for drilling toe holes on benches in Utah Copper mine at Bingham

New Mobile Compressor-Drill Unit Cuts Cost of Toe Holes in Open Cut

FOR DRILLING TOE HOLES on the benches of the big open cut mine of Kennecott's Utah Copper Division at Bingham, Utah, the crawler-mounted combination drill and compressor shown in the adjacent pictures has been developed on the job. The compressor is a Worthington M-75 unit driven by a diesel engine mounted on a tractor chassis, both of Caterpillar make. It gives 294 cfm at 95 psi (at the drill) at 6000 ft. elevation. The drill is an I-R WD 400 drifter, 4 in. in size, and uses I-R A-2 detachable bits and Crucible CA alloy hollow steel.

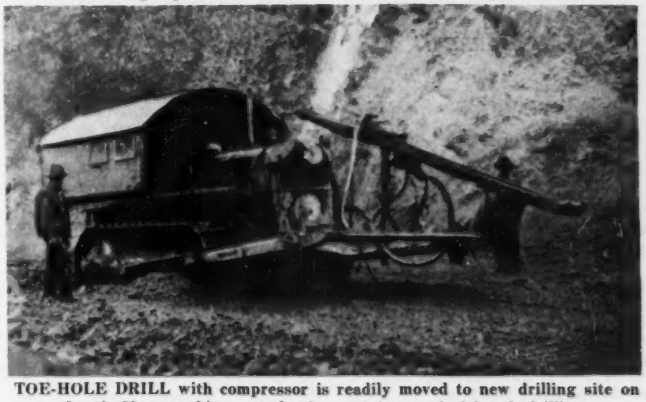
To mount the drill, the rear axles of the drive wheels have been used as pivots for arms and a connecting crossbar holding the adjustable drill-shell clamp. The assembly can be raised or lowered by a block and tackle actuated by a small air hoist.

The length of the drill carriage is 17 ft., making 12-ft. drill changes possible. With the 30-in. sliding cone of the old tripod setup, only 5-ft. drill changes could be made.

A 3-in. starter bit is employed with ½-in. changes. The toe holes are drilled at 24-ft. intervals to a depth of 24 ft. plus. The constant pressure of 95 psi at the drill contrasts with 60 psi obtained when the old tripod setup was used. The latter arrangement required the maintenance and periodic adjustment of about 60 mi. of 2-in. pipe, plus 8-in. feeder piping from the central compressor.

Footage per drill-crew shift in the first six months with the new unit was 343 ft., compared to 96 ft. with the tripod set-up. Formerly a crew-shift amounted to 26 man-hours. With the new unit, it is 18 man-hours and the footage drilled per man-hour with it is 20 ft., against 5 ft. for the tripod setup. The new unit can also be used for vertical bench drilling.

THE 17-FT. DRILL CARRIAGE permits 12-ft. drill changes, compared with 5-ft. changes possible with former method of drilling toe holes.



TOE-HOLE DRILL with compressor is readily moved to new drilling site on bench. New machine can also be used for vertical bench drilling.

WASHINGTON IMPACT

Morton A. Reichek, McGraw-Hill Washington News Bureau

Iron Ore Prospects for Winter Improve Alcan Expanding Despite Stand by U. S.

THE GOVERNMENT NOW GOES ALONG with industry's contention that there'll be enough iron ore this winter to support full-capacity steel production, despite the 54-day steel strike.

Washington had been worried that the walkout of iron ore miners, which halted the flow of ore from the Lake Superior region to midwestern and eastern steel mills, would be calamitous this winter—maybe more so than the summer's production loss of over 18-million ingot tons.

During the peak of the strike, ore movements were about 3% of normal. More than 20-million tons of iron ore was lost, of which about half would have gone into stocks for December-April steel production.

But the steel industry was on the ball. Preparing for the strike settlement, the shippers kept about 60 ore boats at the head of Lake Superior near loading docks to renew the flow of ore at the earliest possible moment. By the morning of July 31, five days after the strike's end, over 1-million tons of ore had been loaded and dispatched.

The Coast Guard is expected to extend the "emergency summer load line" through Oct. 1, which would permit deeper loading of the ore boats, and to consider ice-breaking operations to lengthen the shipping season. In addition, rail lines serving the Mesabi Range in Minnesota have set up a pool of freight cars earmarked exclusively for all-rail ore shipments. The first shipment began July 29, and a daily movement of 450 cars is expected to deliver more than 4-million tons of ore by the end of the shipping season.

By mid-August, iron ore shipments from the upper lakes region achieved the highest weekly rate in history—3,280,094 tons (previous high: 3,258,328 in August, 1943). But even if this weekly rate is maintained, it's doubtful that last year's 89-million-ton total shipment will be matched this season.

If iron ore supplies are plentiful next spring, it will have been demonstrated to the steel industry that it isn't necessary to carry over 20-million tons of ore or more into the next shipping season, thanks to the increased speed and greater carrying capacity of the ore boats which are now being used on the Great Lakes.

Alcan Expansion Program

The Aluminium Co. of Canada is apparently undeterred by its setback at the hands of the Joint Congressional Committee on Defense Production in its bid for a long-term U. S. procurement agreement. It's going ahead with a three-year expansion program, which is estimated to cost at least $350-million.

Last month Alcan opened up the first of 10 new 54,000-hp. generators being installed on the Peribonka River, about 400 mi. northeast of Montreal, which will boost output from its Saguenay Valley Power System 25%. The new power will enable Alcan to (1) run its four Quebec aluminum smelters at full capacity (496,000 tons per annum) this year without buying outside power for the first time, and (2) boost total capacity to 550,000 tons in 1953.

The new powerhouse was opened in the presence of a large corps of U. S. newspapermen, to whom Alcan was playing host on a tour of its Quebec facilities. Included were a contingent of Washington newsmen, for Alcan's future plans are solidly tied to what will happen in D.C.

The company still hopes to step into a long-term U. S. market arrangement, with sales guaranteed by the government. Such a pact is a possibility next year if domestic aluminum producers are unable or unwilling to expand their facilities to meet government mobilization goals.

Power development on the Peribonka is only one aspect of Alcan's expansion program. The others:

1. Bauxite mining and processing projects in Jamaica, B.W.I., where the company is building a $40-million, 165,000-metric ton capacity alumina plant and deepwater port; in British Guiana, where additional kilns for drying and calcining bauxite are being installed at the mines; and on the Los Islands, off French West Africa, where a 250,000-ton capacity alumina plant is being built.

2. An integrated aluminum project in British West Africa's Gold Coast Colony, where the company is studying a plan to harness the Volta River for hydroelectric power, and use nearby bauxite deposits for another big smelter.

3. A hydroelectric project in British Columbia's Nechako River region, with generating capacity of 450,000-hp., and an aluminum smelter in nearby Kitimat, with initial annual capacity of 90,000 tons. The first stage of this project will cost $208-million. The hydro project can be expanded to 2-million-hp., and aluminum smelting capacity to 273,000 tons a year. The outcome of future procurement contract negotiations will determine this.

Bolivian Tin Nationalization

A brief news item in the Washington column of the Aug. 14 *E&MJ* Metal and Mineral Markets rapidly exploded with international repercussions. The item reported that producers "are pleading with the U. S. not to sign a long-term tin contract until the new Bolivian regime eases its state monopoly controls on the mine owners."

Inflammatory headlines appeared in Bolivian newspapers several days later, with dramatically exaggerated accounts of how the sinister mine owners were conspiring in the U. S. to cut off Bolivia's chief source of income. New threats were made against tin company officials, and some mine engineers were reportedly attacked. The incident demonstrated just how desperately the Estenssoro government needs a long-term RFC tin contract.

Estenssoro's NRM ("Nationalist Revolutionary Movement") holds out tin nationalization to Bolivia's discontented populace as the only solution to the country's complex economic and political problems. NRM is actually a hodge-podge of varied political camps—ranging from Fascists to Communists, with Trotskyists thrown in between. It's bound together by hatred for the tin companies and an extreme "anti-imperialist" type of nationalism.

Within NRM there is obvious dissension on what nationalization would involve. Vice President Sile Zuarzo, a right-winger, recently told a *New York Times* interviewer that the plans of Minister of Mines Juan Lechin, a left-winger, were "foolish and fatuous."

To NRM's left wing, mine nationalization means complete expropriation without compensation, and then government operation. According to informed U.S. observers in Bolivia, NRM's right wing, which makes up the majority of the cabinet, is content to permit owners to retain operating control of the tin mines, while the government decides how to disburse foreign-currency earnings.

The right-wingers are at least realistic. They know, as the UN Mission of Technical Assistance to Bolivia reported last year, that: "Even if na-

tionalization of the mining industry were theoretically desirable, it would be wholly impractical in Bolivia under present conditions. The government has neither the financial resources nor the technical and administrative competence to undertake any such task."

Mica Stockpile

The Munitions Board plans to liberalize its mica stockpile specifications about the end of the year. The revision will be made in response to pleas by domestic mica producers that green mica, which makes up most of the U.S. output, be bought for the stockpile along with ruby mica, which is now the only type purchased.

The board is still undecided on how liberal to be. Before its stockpile specifications can be officially revised, the agency must struggle through a classic mass of government red tape.

First the board must complete its survey of 20 leading capacitor manufacturers to learn what the electronics industry thinks about green mica. Most of the manufacturers have already reported, and the board says very few now use green mica. However, the manufacturers said they would use it if performance tests are satisfactory.

Then the board must submit proposed specification revisions to the American Research Council's Metals and Minerals Advisory Committee, The American Society of Testing Materials, the Inter-Departmental Commodity and Stockpile Committees, and the Mica Industry Advisory Committee. When all these have gotten their say in, the stockpile specifications will be revised.

Australian Mining Expansion

About a fifth of this summer's $50-million loan by the world bank to Australia will be used to boost production of lead, zinc, copper, tin, aluminum, tungsten, and pyrites. Output of lead and zinc, Australia's most important metal exports, has not expanded in recent years, while production of other nonferrous metals has been insufficient to meet domestic needs. The loan will be used to import tractors and earth-moving equipment, mining machinery, and equipment for concentrating, smelting, and refining.

Asbestos Mill for Arizona

DMPA plans to enter into a contract with a private company to build a plant to treat raw asbestos found in the Arizona region.

In announcing the plan, Jess Larson, administrator, said funds have been set aside to enable DMPA to enter into negotiations for a floor-price contract set up to 5,000 tons of No. 1 spinning grade crysotile asbestos, and 35,000 tons commercial grade.

He said the chief reason more deposits in Arizona aren't being worked is the lack of milling facilities.

LABOR THIS MONTH

Joseph M. Gambatese, McGraw-Hill Washington News Bureau

Congress investigates Mine-Mill: The long-expected investigation of communist influences in Mine, Mill and Smelter Workers is here, at last. Sen. Pat McCarran's Internal Security Subcommittee will go to Salt Lake City for hearings on Oct. 7 and 8. Among witnesses under subpoena to testify are four Mine-Mill leaders:

President John Clark, of Great Falls, Mont. Clark was elected to the top office in 1947 after the Communists dumped Reid Robinson, who had been president since 1936 when Mine-Mill helped start the CIO. Not a Communist, Clark was chosen as one who would cooperate with them.

Secretary-treasurer Maurice E. Travis. An admitted Communist, Travis publicly announced in 1949 that he resigned from the party, but only to sign the Taft-Hartley non-Communist affidavit. He still believed in Communist principles, he said. The CIO itself, in putting the Communist label on Mine-Mill, said the Communist Party installed Travis as executive assistant to Robinson, then president for a brief period in 1947 after Robinson's resignation. Travis served as president. But the Communists decided that his Communist affiliation was too well known for him to function effectively as president, so they put up Clark who could be a stooge for them.

Al Skinner, Mine-Mill regional director at Salt Lake City. He is coordinator of bargaining with Kennecott Copper Corp.

Graham (Cozy) Dolan, who handles special assignments for Mine-Mill's top officials. Dolan, an expert at propaganda, was Mine-Mill's "educational" director, formerly edited the union's newspaper, *The Union* and a paper called *The Challenger.* The latter publication folded after being branded subversive.

The committee has not disclosed whom its witnesses will be. Mine-Mill itself revealed that four top officials have been called to testify. As the committee did when it investigated Communism in the left-wing public and communications workers, CIO expelled unions, it will receive testimony first in closed session, later decide what to make public.

The committee insists its only objective is the internal security of the United States. Mine-Mill has branded the investigation as (1) inspired by copper interests to undermine the position of the union in current wage negotiations and (2) a maneuver to help the re-election of Sen. Arthur V. Watkins, of Utah, member of the McCarran subcommittee.

Mine-Mill attributes Dolan's indictment to a study he is making of what the union calls Sen. McCarran's "anti-labor record both in Congress and in his home state."

In other union investigations, the McCarran subcommittee has branded the labor organizations as Communist-dominated. One union leader, Abram Flaxer, president of the United Public Workers of America, ex-CIO, was cited by the Senate for contempt of Congress for refusing to answer questions or produce union records.

Most of the witnesses will be leaders of Mine-Mill or former Communists with information on Communist activities in the union. No copper industry representatives have been subpoenaed. The subcommittee does not want to give Mine-Mill a chance to confuse the issue by bringing copper mining employers into the picture.

Meanwhile, Mine-Mill was taking strike votes to back up its demand for a wage increase of 25¢ an hour in copper mining.

Observers speculated that the union would take some dramatic move—possible strike—before the hearings opened.

MANGANESE CONCENTRATES made from Pioche ore will be produced by Combined Metals' subsidiary, Pioche Manganese Co., in this 2,000-ton flotation plant. Concentrates will be nodulized before shipment. This mill, in its two units, can handle 800 tons daily of straight lead-zinc ore and 1,200 tons of manganese ore.

Manganese and Titanium Spark Revival in Southern Nevada

JOHN B. HUTTL
Associate Editor

HENDERSON, NEVADA, site of the gigantic and much-discussed $140-million Basic Magnesium reduction plant, which turned out some 165-million lb. of magnesium metal during World War II, is again a beehive of activity. Visual evidence of this is found in the many construction projects carried out in and around the old BMI plant, and the modern settlements going up on both sides of of the new four-lane Las Vegas-Boulder City highway to take care of the material increase in population.

After shutdown of the BMI plant late in 1944, many predicted a dark future for the plant and the district. Fortunately this never came to pass, and here is why.

Soon after the end of the war, several responsible manufacturing and chemical concerns taking into account the favorable location of the plant in regard to markets and cheap Hoover Dam power, negotiated lease agreements with the government and later with the State of Nevada and moved into the mile-long building complex to set up shop.

Among these were Western Electro-Chemical Co., Stauffer Chemical Co., U. S. Lime Co., U. S. Vanadium Corp., and others. Consisting of 10 separate buildings or units, the BMI plant lent itself very well to multiple tenancy. In some instances the lessee could fit a part of the available equipment into his production facilities.

The arrangement worked out so well that it was only a matter of time until other industries would join and fill the still vacant plant units. Full tenancy was reached when Titanium Metals Corporation of America (jointly owned by National Lead Co. and Allegheny Ludlum Steel Corp.) and Combined Metals Reduction Co. recently acquired the four remaining plant units for the production of titanium metal and ferromanganese. Both concerns joined Western Electro-Chemical, Stauffer Chemical, and U. S. Lime Co. a short time ago in the purchase of the BMI plant from the State of Nevada.

A third important enterprise responsible for the current prosperity in the Henderson area is that of Manganese, Inc., involving construction of a large processing plant 6 mi. east of Henderson for the beneficiation of low-grade manganese ore from the nearby Three Kids mine. During World War II, an attempt had been made to produce manganese nodules by a chemical process, but the plant ceased operation at about the time the BMI plant was shut down in 1944, after turning out several thousand tons of nodules. Construction of the new plant involves an outlay of nearly $3,500,000, and recovery of manganese is strictly by ore-dressing methods. A sketch of these three major enterprises may be of interest.

Manganese Recovery Prime Objective of Two Enterprises

Combined Metals is operating through a subsidiary, the Pioche Manganese Co. The Pioche project comprises two distinct units. In its scope, the first includes the mining, flotation, and nodulizing of the ore at the Caselton property of Combined Metals, near Pioche, Nev.; whence the subsidiary's name. An electric furnace plant for producing ferromanganese

at Henderson is the second unit.

The ore mined and processed at Caselton is a highly complex lead-zinc sulphide containing pyrite, manganese carbonates, and some oxide lead. The gangue is chiefly limestone. It is mined in areas outside the periphery of the regular lead-zinc beds now being worked and underground operations are geared for a daily output of 1,200 tons.

To handle this extra production, the 1,000-ton Caselton mill was enlarged during the past year by adding a 50-ton Sweco Heavy-Media plant, a 10-ft. x 48-in. Hardinge ball mill with a 66-in. Akins DDPS duplex classifier, and appropriate flotation, thickening, and filter equipment. The two ball-mill-classifier units formerly used for grinding regular lead-zinc mine ore and custom ores can now serve as well for the new manganese circuit. The new ball-mill classifier installation mentioned can be used as a part of the lead-zinc circuit as well as for manganese ores.

Five Products To Be Recovered

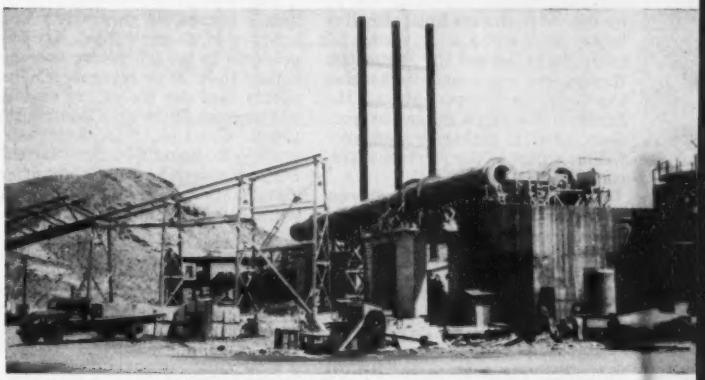
The technique to be used in the manganese section of the mill, where five products will be recovered, is the result of much test work. Thousands of tons of manganiferous ore were milled before the manganese circuit was installed. The iron-manganese tailings were stored in ponds.

Operation of this manganese circuit was scheduled to start in July. The flowsheet includes: Crushing to ⅝ in., treatment in the Heavy-Media plant, and grinding of the sink product to 72-73% minus-200-mesh in two 10-ft. x 48-in. ball mills in closed circuit with 78-in. spiral classifiers.

Pulp overflowing the classifier weirs will go successively to the following for recovery of lead, zinc, and oxide lead: a standard conditioner; a bank of six Fagergren-type 66-in. lead rougher cells; a conditioner ahead of the zinc rougher circuit containing the same equipment as used in the lead rougher circuit; a third conditioner, followed by two Fagergren-type 66-in. cells for recovery of oxide lead; and a 120-ft. thickener. All lead and zinc rougher concentrates produced will receive additional treatment in the respective cleaner sections of the regular lead-zinc sulphide circuit.

Underflow from the thickener mentioned will go to the iron flotation circuit. This consists of a conditioner, three rougher cells, four scavenger cells, and two cleaner cells, all being 66-in. Fagergren units. Tailings will get final treatment in the manganese circuit after going to a fourth conditioner. Then follows flotation in seven Fagergren-type 66-in. rougher cells, five scavenger cells, and seven cleaner cells, providing for three-stage cleaning. Iron and manganese concentrates will be filtered, the first stored for shipment and the second to be trucked to the nodulizing plant now nearing completion a short distance below the filter plants.

MANGANESE ORE from nearby Three Kids mine will be processed by ore-dressing methods and calcining in this plant which is being constructed by Manganese, Inc., 6 mi. from Henderson, Nev. Daily capacity is given as 1,350 tons of crude ore.



CALCINING OF MANGANESE CONCENTRATES to remove flotation reagents will be done by Manganese, Inc., in the two 8x150-ft. rotary kilns in center. The calcine will then be nodulized for shipment in two 9x150-ft. kilns seen further to left and lower down.

Nodulizing Kiln Equipped With Boring Bar

At the nodulizing plant, manganese concentrates and reduction material (coal or coke) will be transported to respective concrete loading hoppers by a Hough payloader. These hoppers are served by a system of cross-belt conveyors discharging to an incline belt conveyor that leads to a pug mill.

When properly mixed, the material will be fed to an oil-fired 9x175-ft. nodulizing rotary kiln through a 12-in. feed pipe. The kiln is belled out to 12 ft. diameter in the center and has a water-cooled boring bar at the firing end.

Hot nodules leaving the kiln will be passed over a Fuller grate cooler, followed by transportation via a 30-in. wide and 100-ft. long Jeffrey oscillating conveyor to the stockpile area adjacent to a rail spur for shipment to Henderson.

The dust-collecting system serving the kiln consists of a PolyClone unit and a MultiClone unit, both of Western Precipitation make, a spray chamber, and an eight-compartment American Wheelabrator baghouse. Dust from the units will be returned to the pug mill.

Construction of the plant was started April 7, 1952, and operations are scheduled to commence early in September. S. S. Arentz, Jr., manager, is in charge of the

Caselton operations. Construction at the nodulizing plant is directed by S. E. Worthen for Pioche Manganese Co.

Electric Furnace For Making Ferromanganese

The Henderson operations of Pioche Manganese Co. are housed in unit J-2 of the BMI plant refinery building. Here, the electric furnace equipment and auxiliary machinery are being installed after raising the roof 30 ft. to provide enough headroom for feed bins and feed mechanisms.

Plant layout is as follows: Nodules, received from Pioche in rail cars, and fluxing materials will go by belt or to storage bins, sampling being done enroute. A system of cross belts served by automatic feeders and scales and discharging the different components of the furnace charge in proper proportions onto a gathering conveyor will be a part of the primary materials storage plant.

Electric furnace equipment now in course of installation consists of two Lectromelt, straight-line, six-electrode units. The charge from overhead storage bins will be fed to the furnace through swivel spouts. Ferromanganese will be collected in trays, and resultant slag will be transported to the slag dump. R. W. Lottridge, plant manager, directs operations at Henderson.

Manganese, Inc. Will Use Ore Dressing Only

The plant of Manganese, Inc., H. S. West president, is now nearing completion about 6 mi. east of Henderson on the site of the old Manganese Ore Co.'s chemical plant. The latter was dismantled after World War II. The new plant is expected to be in operation by midsummer. Its outstanding features are: (1) The plant is perhaps the only one in existence that will treat the type of manganese ore found at the Three Kids mine; and (2) the large investment required per ton of ore treated.

Design of the new plant is the outgrowth of a long research by company engineers and Southwestern Engineering Co. The ore is mined in open pit and trucked to the plant. Here, through proper blending the mill heads will be kept at a manganese content of 22%. Actual construction began in June 1951.

As mentioned previously, the problem of recovering manganese has been tackled from the ore-dressing angle. The plant flowsheet calls for two-stage crushing, very fine grinding to liberate the manganese particles, soap and oil flotation, calcining finished concentrates to remove reagents, and nodulizing the calcines.

Finished concentrates are expected to carry 3½% or more lead, probably oxide, which will be recovered in nodulizing. As the lead is volatilized just before fusion, it has been found that this is done best by adding crushed coke to the wet concentrate. The company has a 10-year government contract under which manganese nodules are to be delivered either to stockpiles or else for immediate consumption.

The flotation process employed is unique because of the variety and quantity of reagents used. Nodules produced in the laboratory average better than 48% manganese. Reagents used per ton of ore treated will average 80 lb. soap skimmings, 120 lb. diesel oil, 7 lb. detergents, and 8½ lb. liquid SO_2. Save for the SO_2, which will be added right after classification, all other reagents will be emulsified and added to the conditioner feed at one time.

The mill proper is divided into two equal circuits and, as built, can handle 1,350 tons of ore a day. Storage capacity is 2,000 tons. There are six storage bins and seven blending bins, all served by a belt conveyor system and Hardinge Constant-Weight feeders.

To reduce mine-run ore to mill feed, a 36x42-in. Traylor jaw crusher and a 30x30-in. Cedar Rapids double-impact breaker are available in the crushing plant. Fine grinding will be done in two Marcy 7x10-ft. open-end rod mills operating in closed circuit with 72-in. Akins classifiers. Each of the two flotation circuits receiving the overflows from the classifiers uses eight conditioner cells, 14 rougher cells, and 17 cleaner cells for four-stage cleaning. All are of the Fagergren type. Finished concentrates will go successively to a 120-ft. Dorr traction thickener and filter plant containing four 10-leaf American disc filters.

Will Nodulize Calcines

Filter cake will be mixed with about 5% of coke and fed by conveyors to two 8x150-ft. rotary oil-fired calcining kilns. The calcines will then be nodulized in a 9x150-ft. rotary kiln, oil-fired, with a section of the center belled out to 12 ft. and a water-cooled boring bar at the firing end.

The nodules will be passed through a cooling kiln 98 ft. long, from which they will be taken by a 135-ft. steel pan conveyor to the automatic sampling plant and stacking conveyor system.

Dust made in the kilns will be recovered in a scrubber system. Final mill tailings will be treated in a 160-ft. Dorr traction thickener. The underflow will be pumped to the old tailings dump, which will hold 1 million tons of tailings before the retaining wall has been raised.

F. A. McGonigle, general manager, is in charge of operations. He is assisted by S. J. McCarroll, general superintendent.

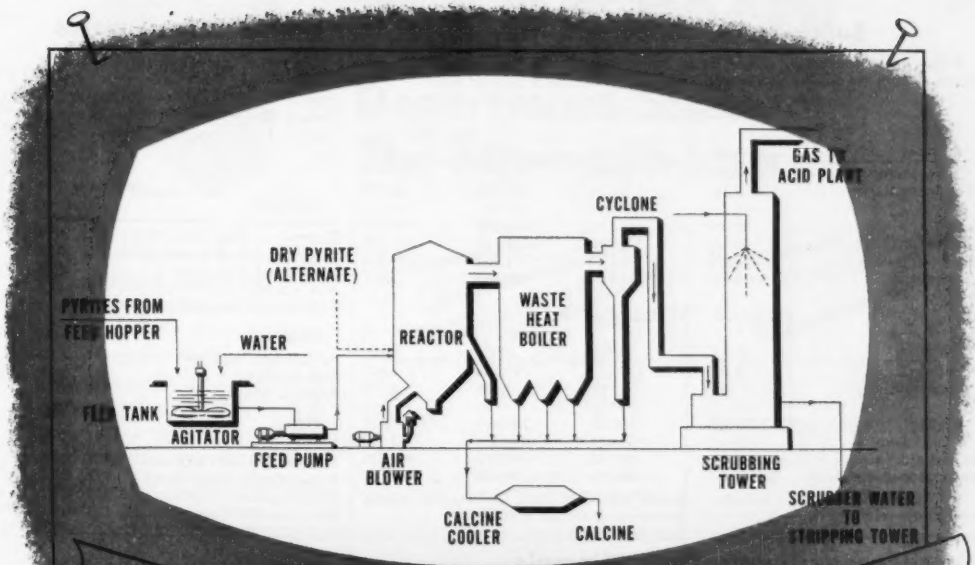
Ductile Titanium Made by Kroll Process

Titanium Metals Corp., producer of titanium metal from domestic and imported rutile concentrates and ilmenite, occupies units 7, 8, and 9 and the old refinery units J-1 and J-5 of the BMI plant. Here, ductile titanium ingots are produced by the Kroll process. Production of titanium ingots should be up to 10 tons daily by the end of 1952.

The Kroll process involves, as a first step, the chlorination of an oxide-carbon mixture to secure titanium tetrachloride. The second step is the Kroll process proper, in which the titanium tetrachloride is reacted with magnesium metal in a heat-resistant steel vessel at a red heat and under an inert gas blanket. The products of this reaction are a commercially-pure spongy titanium metal and magnesium chloride.

The bulk of the magnesium chloride is drained out of the reaction chamber as a liquid and the remnants evacuated as a vapor. It has been found that if the magnesium chloride is passed through an electrolytic cell, both the chlorine and the magnesium can be recovered and continuously recycled. The company is now using part of the former BMI metal-producing facilities to electrolyze magnesium chloride, yielding metallic magnesium and chlorine gas. The chlorine is reused for chlorination of the titanium-bearing ores and concentrates and the recovered magnesium is recycled to react with the titanium tetrachloride to produce titanium sponge and by-product magnesium chloride.

Utilization of the magnesium chloride by-product is an important factor in producing the titanium metal. Operations are directed by R. P. Smith, plant manager, with W. P. Cloyes assisting him.



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 (Continued from page 85)

Summary of Copper Statistics

Following is a summary of the latest copper statistics of Copper Institute, embracing most of the free world's operations in the metal, figures in short tons:

UNITED STATES

Production:	June	July	Jan.–July 1951	Jan.–July 1952
Crude, primary	(a)77,091	78,408	575,774	566,508
Crude, secondary	(a) 3,301	3,730	41,186	29,625
	80,392	82,138	616,960	595,133
Refined copper	92,151	96,049	739,523	675,006
Deliveries, refined	(b)98,416	(b)115,179	772,461	774,162
Stocks, refined	(c)70,856	(c) 73,657	68,045	73,657

OUTSIDE UNITED STATES

Production:	June	July	Jan.–July 1951	Jan.–July 1952
Crude, primary	(a)129,023	118,972	795,140	821,832
Crude, secondary	(a) 346	758	2,469	3,725
	129,369	119,730	797,609	825,557
Refined copper	114,421	99,201	689,833	722,930
Deliveries, refined	(a) 88,676	86,345	564,776	605,920
Stocks, refined	(a)192,603	180,392	159,338	180,392

(a) Revised figures. (b) Includes tonnages delivered from Government stocks. (c) Includes tonnages delivered to U. S. consumers at foreign ports.

Official London Prices

Consumers in the United Kingdom obtain copper, lead and zinc at prices named by the British Ministry of Metals. Delivered prices in effect as August ended were as follows:

COPPER:	Per Long Ton £	s.	d.
Electrolytic, high conductivity	285	0	0
Fire refined, high conductivity	285	0	0
Fire refined, high grade	284	10	0
Fire refined, min. 99.7 percent	284	0	0
Fire refined, min. 99.2 percent	283	10	0
LEAD:			
Soft, foreign duty paid	131	0	0
Soft, Empire	131	0	0
English, refined	132	10	0
ZINC:			
Foreign (G.o.b.) duty paid	122	0	0
Domestic (G.o.b.) duty paid	122	0	0
Prime Western and debased	122	0	0
Refined and electrolytic	126	0	0
Minimum 99.99 percent	128	0	0

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York unless otherwise stated

MISCELLANEOUS METALS

August 30, 1952	
Aluminum, ingot, 99 plus percent, lb. (effective Aug. 4)	20c.
Antimony, spot, lb., 5 tons and up but less than carload, in cases	42.47c.
Bismuth, ton lots, lb.	$2.25
Cadmium, commercial sticks, delivered, lb.	$2.00
Calcium, lb., ton lots, 98 percent, cast	$2.05
Chromium, 97 percent grade, lb., contract	$1.07
Cobalt, 97 to 99 percent, per lb.	$2.40
Indium, troy oz.	$2.25
Nickel, cathodes, lb., f.o.b. Port Colborne (a)	56½c.
Magnesium, 99.8 percent, carloads, lb., producer's plant, Freeport, Texas	24½c.
Palladium, troy oz.	$24.00
Platinum (Official quotation wholesale lots) troy oz.	$90.00
Quicksilver, flask of 76 lbs., 25 flasks or more	$187 @ $189
Selenium, 99.5 percent, lb.	$3.00 @ $3.50
Silicon, minimum 97 percent, carloads, lb.	20c.
Tellurium, lb.	$1.75
Thallium, 100 lb. or more, lb.	$12.50
Titanium, 99.3 percent, lb.	$5.00

(a) Includes U. S. duty.

METALLIC ORES

Beryllium Ore, imported, 10% BeO, per unit	$36.50 @ $38.50
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry	
44% Cr_2O_3 no ratio	$27.00 @ $28.00
48% Cr_2O_3, 3 to 1 ratio	$44.00 @ $56.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$8.70
Mesabi bessemer	$8.45
Mesabi, non-bessemer	$8.30
Lead (Galena), 80 percent, Joplin, Mo., ton	$202.95
Manganese Ore—Per long ton unit of Mn basis 48 percent manganese, nearby positions, subject to premiums and penalties, $1.20 @ $1.22, c.i.f. U. S. ports, duty extra. Long-term contract nominal at 90c. to 95c., c.i.f., duty extra.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	60c.
Tantalite, 60% concentrate, per lb.	$2.00 @ $2.55
Tungsten Ore, per unit of WO_3	
Foreign, 60 percent, f.o.b. foreign ports	$51.00 @ $53.00
Domestic, scheelite, 60 percent f.o.b. mill	$65.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	31c.
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$92.50

(a) F.o.b. port of shipment.

METALLIC COMPOUNDS

Arsenous Oxide (arsenic trioxide) lb., in bbl. carload lots delivered	5¼c.
Cobalt Oxide, 72½% to 73½%, ceramic grade, per lb.	$1.82 @ $1.84½
Copper Sulphate, 100 lb.	$8.95 @ $9.95

ALLOYS

Beryllium Copper, 4 percent Be, per lb. of alloy, 5 lb. ingot	$1.56
Ferrochrome, 65 to 69 percent, per lb. of Cr contained	21½c.
Ferromanganese, 78 to 82 percent, gross ton, seaboard	$225
Ferromolybdenum, 55 to 65 percent Mo. lb. of Mo. contained	$1.32
Ferrosilicon, 50 percent, per lb. of contained Si	12.4c.
Ferrotungsten, 75 to 80 percent, lb. of W contained	$4.85
Ferrovanadium, per lb. of V delivered	$3.00 @ $3.25
Silicomanganese, Max. 1½ percent carbon, per lb. contracts	9.9c.
Spiegeleisen, per long ton, 19 @ 21 percent grade	$85.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds) ton:	
Crude No. 1	$960 @ $1,500
Crude No. 2	$595 @ $900
Spinning fibers	$275 @ $475
Shingle fibers	$123 @ $170
Paper stock	$85 @ $119
Waste	$63 @ $70
Shorts	$30 @ $63
Asbestos, Vermont, f.o.b. Hyde Park:	
Spinning fibers	$279.50 @ $302.00
Shingle stock	$135.00 @ $162.00
Paper stock	$81.50 @ $115.00
Waste, stucco or plaster	$71.40
Refuse or shorts	$34.00 @ $63.00
Barytes, f.o.b. mines:	
Georgia, crude, per long ton	$13.00 @ $13.50
Missouri, 93 to 94 percent $BaSO_4$, per short ton	$10.15 @ $10.40
Bauxite, long ton, f.o.b. point of shipment:	
Domestic, crude, 50 to 52 percent (not dried)	(a) $4.50 @ $5.50
Domestic, chemical, 53 to 58 percent	(a) $8.50 @ $9.50
Domestic, abrasive, 80 to 84 percent	(a) $18.00 @ $18.50
China Clay, f.o.b. mines, ton:	
Georgia, filler and ceramic grades	$8.50 @ $9.50
North Carolina ceramic grade	$20.25 @ $22.25
Feldspar, bulk ton:	
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50 @ $22.25
Glass feldspar, white, 20 mesh	$11.75 @ $12.50
Fluorspar, f.o.b. mines, bulk, 70% effective ton	$43.00
60% effective CaF2	$40.00
Acid 97% concentrate, bulk, ton	$60.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00 @ $14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington	$36.30
Mica—Domestic, f.o.b. mines. Punch 12 to 22c. per lb. according to size and quality. Sheet, clear, 1½ x 2 inch, 80 to 85c.; 2 x 2 inch, $1.10 to $1.20; 2 x 3 inch, $1.50 @ $1.60; 3 x 3 inch, $1.80 @ $1.90; 3 x 4 inch, $2.20; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton	
Scrap, $32 and up.	
Ocher, Georgia, ton, in sacks	$26.25
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	Not quoted
Sulphur, Texas, mines, long ton	$22.00
Talc, f.o.b. works, ton:	
New York, purified	$18.50 @ $20.00
Vermont, extra white	$12.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$30.00

(a) Nominal.

IRON AND STEEL

Pig iron, gross ton, basic, Valley furnaces	$52.00
Steel, f.o.b., Pittsburgh billets, net ton	$59.00
Structural shapes, 100 lb.	$3.85

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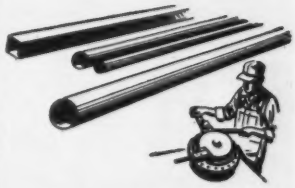
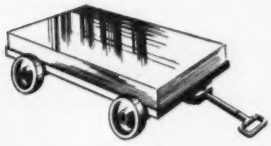


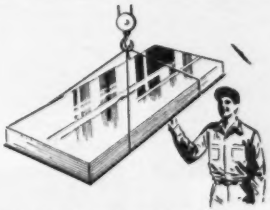
WELDED MECHANICAL TUBING

Hot and cold rolled, rounds and squares in a wide range of sizes. Consider cost. Substitute for seamless tubing.



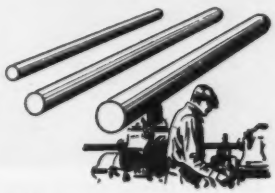
CARBON SHEETS

Both hot and cold rolled coming into better supply, especially cold rolled in the heavier gauges.



STRAIGHT CHROME STAINLESS

No allotment required for these stainless bars, plates and sheets—and they can often replace restricted nickel-bearing types.

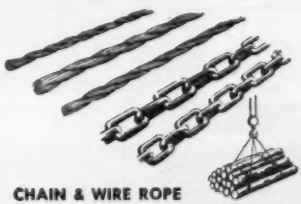


TOOL STEEL

Water, oil or air hardening steel. High in quality; economical in price. Hardening data with every shipment.

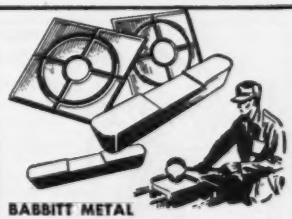
SAFETY PLATE

Strong, non-skid Inland 4-Way Safety Plate protects feet against slipping, floors against wear. Easily fabricated.



CHAIN & WIRE ROPE

Rugged, dependable TM chain, iron, steel and alloy qualities, furnished to order. High quality wire rope shipped from large stocks.



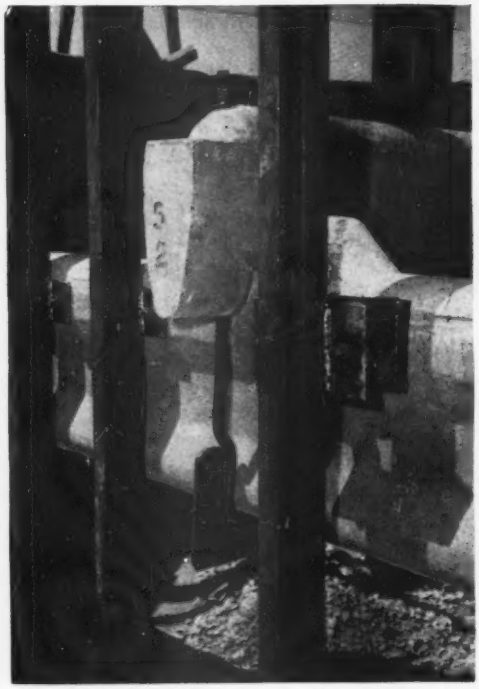
BABBITT METAL

Glyco Babbitt, an exclusive Ryerson product, has physicals equal to high tin Babbitts; costs substantially less and is unrestricted.

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS: NEW YORK • BOSTON • PHILADELPHIA • DETROIT • CINCINNATI • CLEVELAND
PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SEATTLE • SPOKANE

OPERATING IDEAS



D. BUNTON (above) acts as separator for parallel A, B, and C buntons. Note how D rests on C and is fastened with flanged U-bolt. C, in turn, supports guides.

Reinforced Concrete Shaft Members Have Several Advantages

AT THE THREE 24 ft. 1 in. dia. round shafts of Virginia Gold Mine in the Orange Free State, concrete buntons (shaft timbers) were used to support shaft guides in the concrete-lined shafts. Concrete buntons of this design were chosen for several reasons:

- Being narrow (7 in. wide) and streamlined, they will increase the air-carrying capacity of the shafts.
- They are resistant to corrosion, rot and also water soaking.
- They are cheaper than steel and are cast by a special vacuum process. (Stone from the shaft was used as aggregate.)

The buntons are used to support the guides, and were not designed as compressional members. In the circular shaft, three parallel buntons, A, B, and C, support one divider bunton, the D, which rests at right angles to them. They divide the shaft into six compartments. Sets are installed at 15 foot vertical intervals.

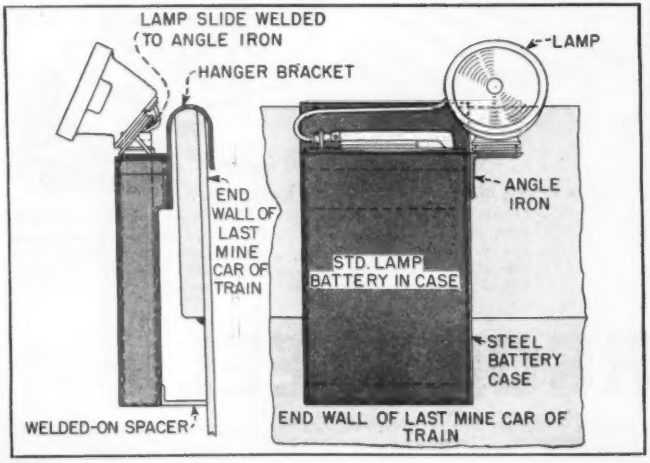
A: 24 ft.-8 in. long, 20 in. deep, 7 in. wide, weighing 3,450 lb.

B: 22 ft.-0 in. long, 20 in. deep, 7 in. wide, weighing 3,080 lb.

C: 19 ft.-4 in. long, 20 in. deep, 7 in. wide, weighing 2,710 lb.

D: 15 ft.-9 in. long, 12 in. deep, 6 in. wide, weighing 1,300 lb.

Try This Taillight on Your Underground Haulage Train


LAMP SLIDE WELDED TO ANGLE IRON
HANGER BRACKET
LAMP
ANGLE IRON
END WALL OF LAST MINE CAR OF TRAIN
STD. LAMP BATTERY IN CASE
STEEL BATTERY CASE
WELDED-ON SPACER
END WALL OF LAST MINE CAR OF TRAIN

THAT'S NOT AN ORDER, but we do recommend it. This simple taillight is made from a standard miner's lamp. It can be attached to the last car of a train in a few seconds, and comes off just as easily. It has become a standard piece of safety equipment at New Park Mining Co.'s operation, Keetley, Utah. There, motormen check out a taillight assembly each morning from the lamp room, and return it at the end of the shift.

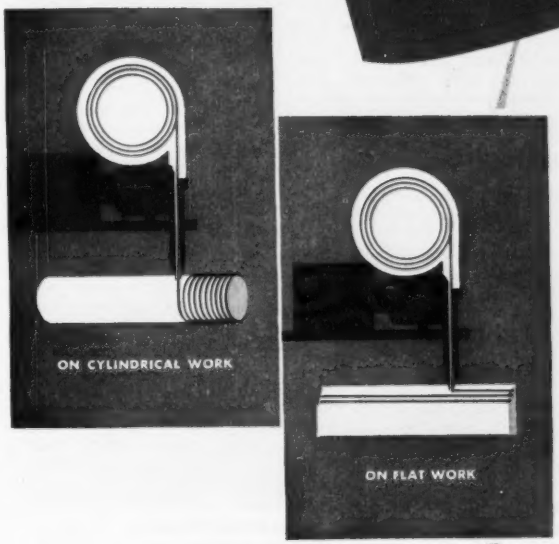
The standard miner's lamp battery fits into a sheet-metal case with three brackets welded to it. A bottom spacer holds it out from the back wall of the car. A hanger bracket slips over the top of the back wall. A small angle-iron bracket on the case is fitted with the regular lamp slide support.

(Please turn to page 132)

See mining equipment

Automatically Hard-Faced

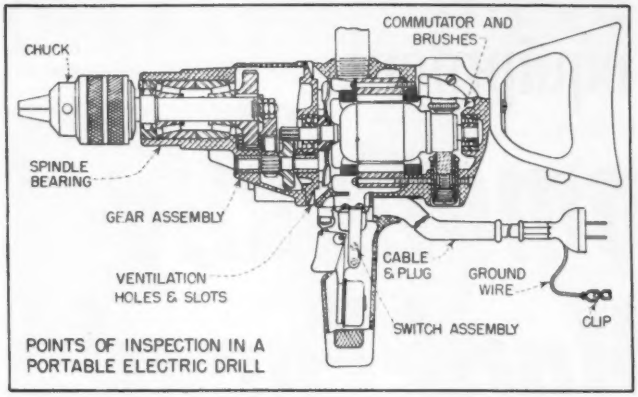
MINING CONGRESS
DENVER, COLORADO
SEPT. 22ND-25TH.



You are cordially invited to the Stoody booth to see automatic rebuilding and hard-facing in action. Many common types of hard-faced mining equipment will be on display. Learn how this new method of wear protection can help you!

Booth 1201-1207 Mining Congress, Denver, Colorado

STOODY COMPANY
11940 E. Slauson Avenue
Whittier, California



POINTS OF INSPECTION IN A PORTABLE ELECTRIC DRILL

Safety and Maintenance Hints for Portable Power Tools

NOW THAT PORTABLE POWER TOOLS are used so extensively in mine, mill, and smelter shops, Paul Ziemke, of Oak Ridge, Tenn. points out that maintenance of these tools should receive special attention to prevent (1) machine failure, and (2) electrocution of workers.

Shop tests for dielectric are often carelessly made. Mere use of a lamp-in-series-across-the-line is not enough since the voltage is too low. Measured value of insulation varies inversely with the test voltage used, and the sensitivity of the measuring instrument used. For instance a ¼-in. drill in service for several years was tested under various conditions. Its insulation resistance measured 35-million ohms at 30 v. dc; 1.3-million ohms at 250 v. dc, the common mine voltage; and 810,000 ohms at 500-v. dc. After cleaning and drying, the same drill measured 40-million ohms at 30 v.; 4.5 million ohms at 250 v.; and 33-million ohms at 500 v. Thus tests obtained by various shop electricians may not agree with those made with more accurate devices. Also an electrician depending upon a 30-v. ohmmeter may get optimistic results, while another using a 500-v. instrument might reject tools that are still serviceable.

Direct current, 100 to 500 v., is popular for testing portable electric equipment. Most shops handling many portable tools use a medium standard of 250 v. dc., and a minimum resistance value of 300,000 ohms. The 250-v. value is ideal for 115-v. tools because it will not puncture the insulation. The 300,000-ohm level will limit leakage with a large margin of safety for tools without a third wire conducting fault currents to ground.

In the accompanying drawing, note the heavy-duty clip (third wire attachment) connected to the plug. This is attached to any convenient ground such as rails, pipes, or structural steel. The non-polarized plug can be attached to any conventional receptacle. Where many tools are used, and grounding facilities are lacking, a temporary stranded ground wire should be laid.

Milling Ideas from Australia

THE MCGRAW-HILL WORLD NEWS correspondent picked up these interesting operating ideas in use at mills on Australia's Golden Mile:

Flint Cement for Pump Parts. One mine has been repairing worn sand-pump casings by applying a lining of flint cement. These reconditioned casings are not suitable for pumping very coarse pulp, such as ball-mill discharge, but give excellent results with fine pulp. This operation had eight 2-in. and six 3-in. pumps in operation, and in 5½ years, only ten 2-in and nine 3-in. new casings have been used. By comparison a new casing on one of the 2-in. pumps handling concentrates lasts only 80 to 90 days. For best results the flints are crushed to pass ⅛-in. screen, and mixed dry in the proportion of two parts flints to one part Portland cement. To get the best life out of the casings rubber-covered follower plates must be used. This is because after several reconditionings, very little of the inside casing face remains to make joint with the follower plate.

Ball-Mill Discharge Cones. When discharge cones are held in place by a long bolt, difficulty is experienced in tightening the nut; the nut wears out, the wrench will not grip it; and the cone tends to turn. Kalgoorlie practice is to dispense with bolt and nut, and to weld the cone in place, the points of the vane being welded to the mill end.

Centrifugal Sand Pumps. If about 2-ft. of delivery pipe just above the sand pump is replaced by flexible rubber hose, it is much easier to make a joint between the delivery and the pump.

Longer Life for End Liners. Use of radial lugs in experimental feed end liners has increased the life of the liners by 50% in one ball mill, and 100% in another. Both mills were 5 ft. 6 in. x 11 ft. The experimental data was acquired for lugs 3 in. wide by 1 in. high. Lugs now used are 1½ in. high.

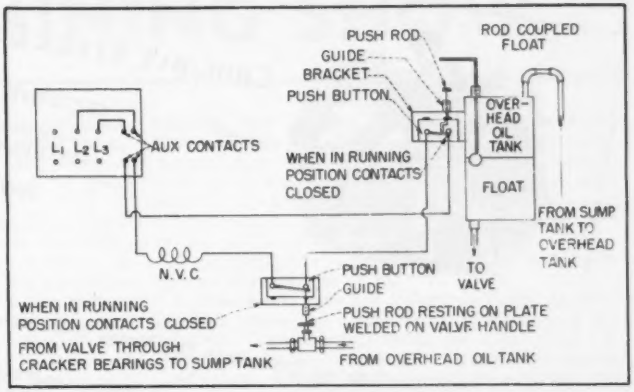
Clarifier Cloths. Practice in the past has been to remove cloths showing holes, and to wash, dry and patch by sewing. Now much of this work is eliminated by using waterproof cement for fixing patches. The cloth is washed and scrubbed thoroughly around the hole, and the cement applied to the cloth and calico patch.

Thickeners. A screen with openings of about 2½ in. is welded to the bottom part of the center pier of thickners to cover the discharge cone. Without interfering with the operation of the thickener, this screen will hold back any oversize foreign objects which would otherwise block the discharge valve.

Dismantling Symons Crushers. Fine ore packing into the threads of the adjustment ring and bowl often makes it difficult to remove the bowl. Usual practice is to grease the threads before assembling in the belief that the bowl will come off more easly. Actually, this increases the difficulty as the ore gets mixed with the grease. So in one large mine, grease has been omitted with success.

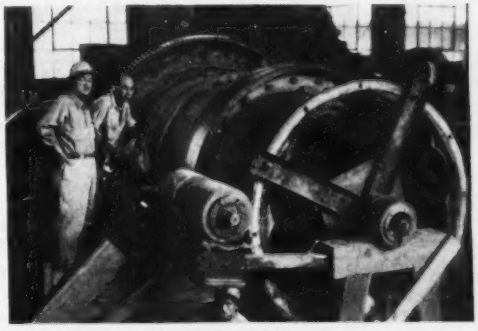
Electrical Interlock Protects Jaw Crusher

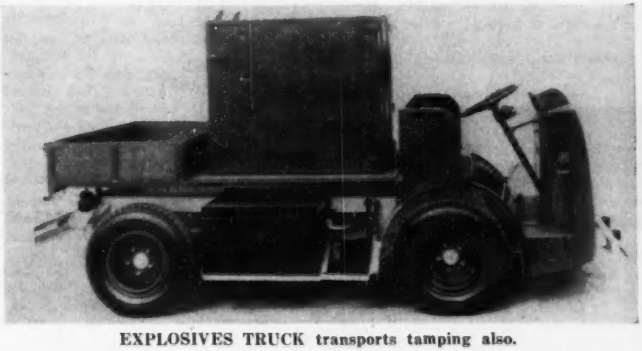
ONE AUSTRALIAN GOLD PRODUCER has fitted the above electrical interlock in the main oil feed line of the jar crusher as shown. The crusher cannot be started unless the lubrication has been turned on, and it is shut down if the oil supply cuts out. The arrangement comprises a fullway valve in the oil line with quick-action and spindle traveling outward as the valve is opened. An extension pin is fitted to the valve to enable a push button to be closed as the valve is opened. This actuates a float-switch fitted to the supply tank. Note that if the oil level in the supply tank drops excessively, the circuit will be broken by a float and push-rod.



Ingenious Ball Mill Repair

W. D. (BILL) HODGIN of Cia. Industrial "El Potosi", S. A., Chihuahua, Chih., Mexico, submits this unusual repair technique. The mill shown is a Cole-Bergman unit which has no discharge-end trunion bearing; the riding ring and chain rollers taking its place. The mechanical staff found it much easier and quicker to make a temporary trunnion bearing out of one of the chain rollers; set up a lathe adjacent to the mill, and turn down the riding ring. in place, instead of dismantling the ring to take off the ring. This job was completed in 10 hours. Shown here are Bill Hodgin and M. Escalera, assistant master mechanic, who conceived and executed the idea.

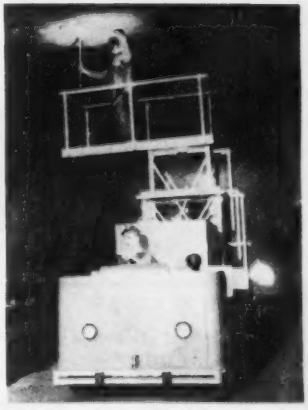




EXPLOSIVES TRUCK transports tamping also.

Multi-Purpose Battery Truck for Mines

BATTERY-POWERED TRUCKS are used to haul explosives, scale roofs erect steel, and install cable, at the Dragonby mining operations of United Steel Companies, Ltd., England. The telescopic tower can be extended to reach an 18-ft. roof. The trucks are made by Smith's Electric Vehicles, Ltd., Gateshead, England. They are equipped with a 2-ton chassis, designed for a speed of 4mph. Batteries are changed with a hand-operated elevating platform truck. Both motor vehicles are of the Metro-Vick series-wound fan ventilated traction type of 10.6 and 12.6 hp. (1-hour rating), respectively. Each truck is equipped with separate batteries for lighting.



TRUCK WITH TELESCOPIC tower for scaling.

REG. U. S. PAT. OFF.

CRUCIBLE STEEL COMPANY OF AMERICA

Cable Address "CRAMERICA"

EXECUTIVE DEPARTMENT
HENRY W. OLIVER BUILDING
PITTSBURGH 22, PA.

July 23, 1952

To our friends in the Mining Industry:

The American Mining Congress meets for the 52nd time, faced as usual with many problems that require serious thought.

Among the most serious of these is high operating costs. A practical answer to this problem is good steels in the hands of good miners. It has been and will continue to be the aim of the Crucible Steel Company of America to furnish the Mining Industry with the finest quality steels that metallurgy can produce.

You are cordially invited to visit us in Booth 206 so that we can discuss the newest developments in Hollow Drill Rod Steels.

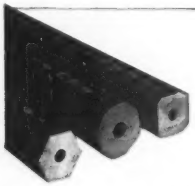
Sincerely,

W. H. Wiewel

W. H. Wiewel
Vice President - Sales

VISIT US IN DENVER!

We will be in Booth 206, American Mining Congress Convention and Exposition, Denver, Colorado, September 22nd to 25th.



CRUCIBLE first name in special purpose steels

52 years of Fine steelmaking **HOLLOW DRILL RODS**

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

1952 MINING SHOW

WHEN YOU HAUL YOUR WEARY FRAME aboard plane, train or bus at the close of the 1952 American Mining Congress Mining Show in Denver, we hope you'll have accomplished the three main objectives of these meetings:

1. **You'll have a bagful of equipment ideas.** To be sure you exploit the equipment exhibit to the fullest, systematically check all the booths where new products are being shown that may help you solve your mine, plant or shop problems. To save you time in checking, you will find a list on the next few pages of who's exhibiting what and where. Most manufacturers have free literature available and their representatives at their booths will be glad to talk over your problems. Don't hesitate to take advantage of this to get all the information you possibly can.

2. **You should have a good slant on the state of the mining industry,** politically, economically and technically. The program (see below) is loaded with speakers who can give you timely and, frequently, little-known information on the subjects they cover. Arrange your time so that you don't miss the papers that are of most value or interest to you. A brief study of the program will help. Take an active part in discussions. If you're not clear on a point, ask questions. The speakers welcome such interest. And if you can contribute pertinent information, you should feel an obligation to do so.

3. **You should have had a darn good time.** No mining man needs any advice about this phase of the business. There are two things we might point out though. One is the attractions on the social program (see below). Second, at the registration desk, a list of registrants with the names of the hotels where they are stopping is available for your use to look up old and new friends.

If you can post a satisfactory score on all three counts, you and your company have more than gotten their money's worth out of the 1952 mining show.

PROGRAM

MONDAY, SEPTEMBER 22

9:45 am OPENING SESSION
Welcome to Denver and Colorado
J. Quig Newton, Mayor of Denver
D. J. V. Thornton, Governor of Colorado
Responses by American Mining Congress Officials
Howard I. Young, Otto Herres, William J. Coulter, Charles B. Stainback
Introduction of Distinguished Guests
Howard I. Young

2:00 pm NATIONAL MINERAL POLICY
Panel Discussion on report of President's Materials Policy Comm.
Led by Arthur Bunker, G. R. Brown; Howard I. Young, presiding
Defense Minerals Progress
Howard I. Young
Resolutions Committee Report

2:00 pm PROGRESS IN MECHANIZATION
Trends in Underground Mechanization
S. S. Clarke, Eagle-Picher Min. & Smelt. Co.
Packaged Timber Handling
W. H. Love, Hecla Mining Co.
Use of Diesel Engines Underground
John East Jr., USBM
Responsibilities of Manufacturer and Mine Operator
Ewald Kipp, Eimco Corp.

TUESDAY, SEPTEMBER 23

9:45 am PUBLIC LANDS PANEL
Moderator: Hon. Arthur V. Watkins, U. S. Senator, Utah; Hon. Wesley D'Ewart, Member of Congress, Montana; Hon. Wayne N. Aspinwall, Member of Congress, Colorado; Robert M. Searles, Attorney-at-Law, San Francisco; A. O. Bartell, Raw Materials Survey, Portland, Ore.; R. B. Holbrook, Attorney-at-Law, Salt Lake City.
Report of Resolutions Committee

11:00 am SMALL MINERS PANEL
Burt B. Brewster, chairman
H. W. Balsley—Small and independent uranium miners
George H. Teal—Tungsten
(To be announced)—Manganese
E. M. Tittman—Smelters and Small Miners
Robert S. Palmer—"Summing Up"

9:45 am OPEN-PIT MINING
Blast Hole Rotary Drilling in Open-Pit Mining
George R. Putnam, Utah Construction Co.
Large Capacity Truck Operation
H. Carroll Weed, Inspiration Consol. Copper Co.
Hydraulic Transport of Solids
I. S. Tillotson, International Mineral & Chemical Corp.

2:00 pm MANPOWER-LABOR RELATIONS
Eliminating Subversives from Government
Hon. Pat McCarran, U. S. Senator, Nevada
A Sound Labor Relations Program
Hon. Wingate H. Lucas, Member of Congress, Texas
Recent Wage Contract Negotiations
Paul H. Hunt, Park Utah Consol. Mines Co.
Report of Resolutions Committee

2:00 pm SHAFT SINKING; ROOF BOLTING
Symposium on Shaft Mucking
Elmer Tomkinson, Shattuck-Denn Mining Co.; F. Morris Sauerwein, New Jersey Zinc Co.; John G. Hall, Chief Consol. Mining Co.
Roof Bolting at TCI's Ore Mine
T. S. Chabot, Tennessee Coal & Iron.
Accounts of Roof Bolting Progress
Lloyd Pollish, Anaconda Copper Mining Co.; William B. Foster, Sunshine Mining Co.; Carmen Romano, Westvaco Chemical Div.
A Highly Mechanized Shaft-Sinking Operation
C. Kremer Bain, Consulting Engineer

WEDNESDAY, SEPTEMBER 24

9:45 am TAXATION PANEL
Moderator: Hon. Thomas E. Martin, Member of Congress, Iowa; Hon. Edwin C. Johnson, U. S. Senator, Colorado; Hon. Wilbur D. Mills, Member of Congress, Arkansas; Henry B. Fernald, Loomis, Suffern and Fernald (New York); Ellsworth C. Alvord, Alvord and Alvord (Washington, D. C.); L. J. Randall, Hecla Mining Co.
Report of Resolutions Committee

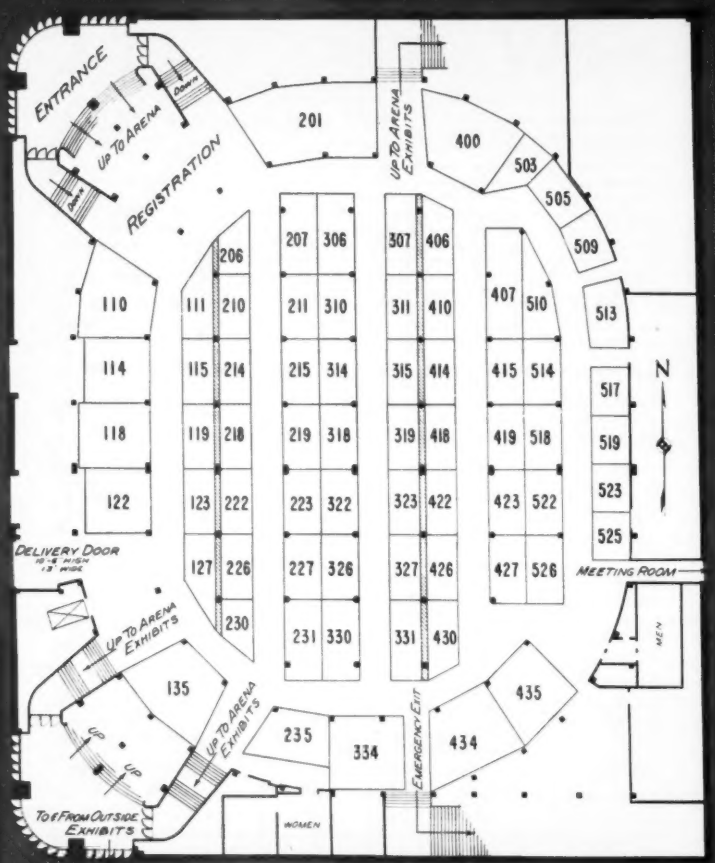
11:00 am GOLD, SILVER, AND MONETARY POLICY
Donald H. McLaughlin, Homestake Mining Co., chairman
Hard Money Vs. Inflation
Hon. Francis Case, U. S. Senator, South Dakota

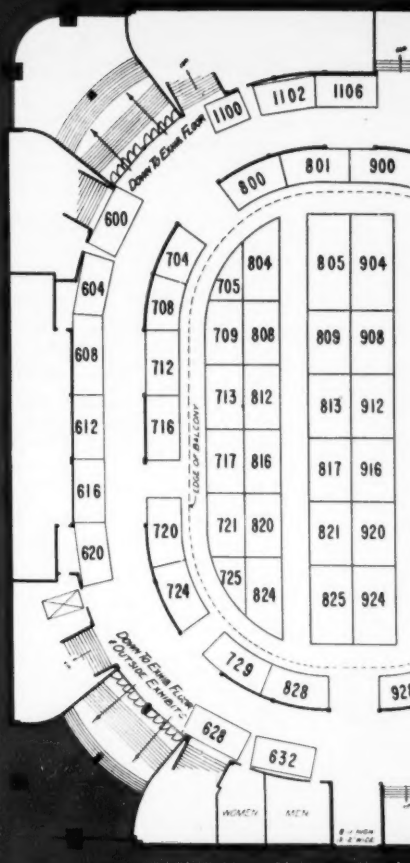
9:45 am ADVANCES IN MILLING PRACTICE
Treatment of Complex Lead-Zinc Ores
Blair L. Sackett, International Smelt. & Ref. Co.
Discussion: W. L. Zeigler, Pend Oreille Mines and Metals Co.
Improvements in Milling Practice in Southeast Missouri
Norman A. Stockett, St. Joseph Lead.
Upgrading Tungsten Concentrates
Keith Kunze, Getchell Mines Inc.
Afternoon open for uninterrupted inspection of exhibits

(Continued on page 140)

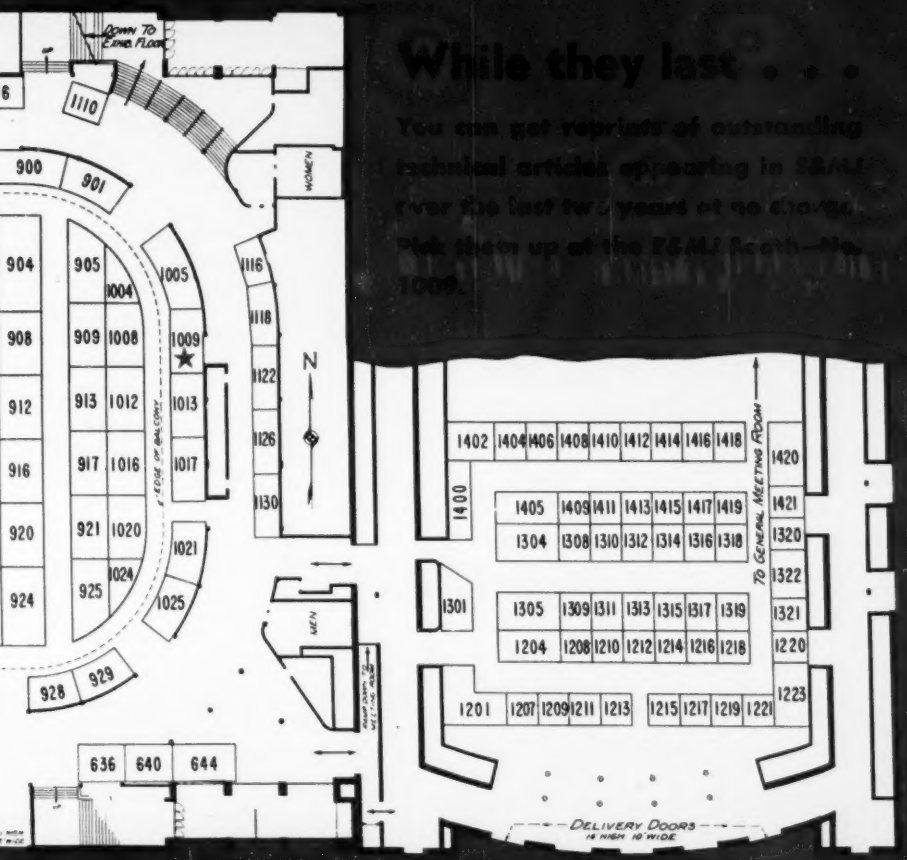
Who's Exhibiting What . . . and Where

BOOTH	COMPANY	MAN IN CHARGE	FEATURES
3-7-311-319-323	Jeffrey Mfg. Co.		Jeffrey, celebrating a 75th anniversary, will show 1½ and 15-ton locomotives, section of 36-in. belt conveyor, a 36 x 24-in. swing hammer crusher, the Midget blower and Aerodyne mine fan, pan feeder, chains and pillow blocks.
110-114	American Air Filter Co., Inc.	John M. Kane	Dust collecting equipment and Cycoil and Multi-Duty filters for cleaning engine and compressor intake air.
111-115-119-123-127	Hewitt Robins, Inc.	R. U. Jackson	Heavy construction, ore handling belt conveyor, vibrating screen with screen-cloth heating unit, and heavy-duty scalper able to handle rocks weighing up to 9,000 lb. each at 1,100 tph.
118-122	Gardner Denver Co.		Air operated jumbos, loaders, hoist, mining machines and sump pumps. Also compressors, pneumatic tools and air motors.
128	E. D. Bullard Co.	Alpheus Bull	Three new models of molded Fiberglas hard boiled hats, one guaranteed to test 10,000 v. with leakage of no more than 5 milliamps.
135	LeRoi Co. Cleveland Rock Drill Div.	N. W. Reinke	Self-leveling mine jumbo for 4-ft. steel change drifter plus assorted rock drills, including jacklegs.
201	Ingersoll-Rand Co.	L. H. Geyer	Lightweight drilling equipment for use with Carset Jackbits.
206	Crucible Steel Company of America	Michael Stumm	Crusca hollow drill steel and Double Diamond alloy hollow drill steel.
207-211-306-310	Eimco Corp.		Complete lines of loading machines and filtration equipment.
210	Olin Industries, Inc. (Explosives Div.)	A. J. Barocca	Representative display of dynamites and blasting caps.
214-218	Western Rock Bit Mfg. Co.	M. W. Hawkesworth	First display of Liddecoat tungsten carbide insert bit plus various Liddecoat steel bits and accessories for preparing drill rod for them.
215	Nordberg Mfg. Co.	J. D. Grace	Operating scale models of Symons V-screen.
219-223-227-231-318-322-326-330	Caterpillar Tractor Co.	M. E. Fearis	D7 tractor, DW10 wheel-type tractor, D397 electric set, Traxcavator.
222	Humphreys Investment Co.	Whitman E. Brown	Humphrey spiral.
226	Gould-National Batteries, Inc.	George Walsh	Industrial storage batteries.
230	Southwestern Engineering Co.	H. V. Hughes	Drop into Sweco's lounge for coffee and discuss new trends in design with Sweco staff. See new screen.
235-334	R. G. LeTourneau, Inc.	Stephen Czerwinski	Giant 50-ton rear dump Tournarocker; rubber-tired tractor high speed Tournadozer; C Tournamatic Tournapull with 16 cu. yd. carryall.
314	Simplicity Engineering Co.	Ralph C. Johnson	Two vibrating conveyor units for hot or abrasive materials.
327	Simplex Wire & Cable Co.	E. J. MacKenzie	Complete line of insulated wires and cables.
331-440	Hercules Motor Corp.	M. R. Humphrey	Hercules engines with one cut-away to show working mechanism.
400-503	Allis Chalmers Mfg. Co. (Tractor Div.)	A. E. Dorn	HD-206 and HD-15 tractors and parts.
406-410	Independent Pneumatic Tool Co.	B. H. Johns	Drills and drifters with auxiliary equipment.
407-415	Allis Chalmers Mfg. Co.	R. N. Brown	A 348-ft. screen with Thermo-Deck heating unit; scale models of jaw and Hydrocone crusher; operating ball-mill display with solids-handling pump; plus pumps, motors and drives.
414	Electric Storage Battery Co.	J. G. Bauska	Exide-Ironclad with Silvium and polyethylene bottom bar.
418	Anaconda Wire & Cable Co.	C. B. Peck	Dioramas of various phases of mining with samples of products that apply.
419-423-427-518-519-522-523-525-526	Joy Mfg. Co.	O. J. Neslage	Mechanized drilling unit; 3500-ft. diamond core drill; diesel-electric shuttle car; air feed leg for light drills; slusher and multi-purpose hoists and axial flow fan.
422	Bucyrus-Erie Co.	Emory M. Heuston	Photographs of Bucyrus-Erie products in action in mining.
426	Galigher Co.	J. T. Potts	Operating models of Agitair flotation machine; sampling machines, slurry, slush and sludge pumps; Davis agitator, laboratory Agitair and ball mill.
505-509	Cummins Engine Co., Inc.	J. T. Weber	Two activated cut-away diesel engines.
513	Flexible Steel Lacing Co.	H. J. Beach	A 20-ft. conveyor showing company's fasteners in action.
510-514	Chicago Pneumatic Tool Co.	E. R. Goss	You'll see a new rail-mounted, twin boom jumbo and can get the feel of new Airleg handling. Also stopers, drifters, sinkers, diamond drills and maintenance tools.
600	Hercules Powder Co.	M. R. Budd	Samples of company's complete set of explosives and blasting supplies and the V.A.O. blasting meter.
604	General Cable Corp.	J. D. Clapp	Demonstration of Safety Mineral insulated wire.
608	Mine Safety Appliances Co.	D. F. McElhatten	MSA MinePhone communications system; an fm carrier system providing instant two-way voice communication; Edison Model R-4 electric cap lamp; and in addition, the exhibit will contain the latest in oxygen administering equipment, breathing apparatus, respirators, and first aid equipment.
612	Thomas A. Edison, Inc.	R. H. Weeks, Jr.	Two Edison Nickel-Iron-Alkaline storage batteries, one for trammer locomotives, the second for industrial lift trucks and tractors.
616	Traylor Engineering & Mfg. Co.	C. Hayward Roberts	Photos and visual display of jaw and gyratory crushers, grinding mills, feeders, kilns, coolers, driers.
620	Fiske Brothers Refining Co. (Lubriplate Div.)	J. B. Tiernan	Two moving displays will show lubricant performance, one on equipment under water.
628	Twin Disc Clutch Co.		Plastic model and actual torque converters and hydraulic couplings.
632	Service Supply Corp.	H. A. Maloney	The Lodover, a combination overhead and front end loader, mounted on the TD-9 International Harvester tractor.
632	International Harvester Co.	C. P. Wells	Model UD-9A power unit cut-away diesel engine, plus motion picture illustrating service supplies loaded with shovel in mining applications.
636	Jones & Laughlin Steel Corp.	E. A. Toothaker	Graphic display of case histories of J&L wire rope, heat-treated, abrasion resistant Jalloy plate, and Otiscloy, a high strength, lightweight alloy.





BOOTH	COMPANY	MAN IN CHARGE	FEATURES
644	Bird Machine Co.	J. J. Gillis	Continuous centrifugal filter, the Bird centrifugal classifier, and the Bird-Young vacuum filter.
704	Rock Bit Sales & Service Co.	John Neamand	Long hole drilling tools for holes varying from 20 to 150 ft. deep with standard percussion-type rock drills; also 4-point Intra-Set carbide tipped drill steel. Also various types of bits.
705-804	Goodman Mfg. Co.	John James	Industrial type shaker conveyor for moving hot and abrasive materials. Three mine locomotives, including a new 4-ton diesel unit.
708	Lake Shore Engineering Co.	P. D. Steele, Jr.	Working model of new "Jeto" bottom dump skip, complete with dump scrolls operating in a skeleton headframe with two skips in balance. Also a model of Lohed mine car demonstrating the door closing and sealing arrangement to insure water-tightness.
709	Alloy Steel & Metals Co.	J. M. McKean	The Pacific "Round-the-Corner" sheave block, the Pacific "Slushmaster" scraper and the Pacific Model C half-shroud sheave block.
711	Union Wire Rope Corp.	Ray G. Noble	Sling display board will show all Tuffy slings. Also samples of Tuffy slusher rope, Tuffy draglines, hoist lines and non-rotating lines.
712-716	Raybestos-Manhattan, Inc.	A. L. Hawk	A products display and an underground mining conveyor in operation with a Manhattan conveyor belt. Also samples representing new developments in conveyor belt construction for mining.
715	Card Iron Works		Information not available.
717	Productive Equipment Corp.	L. H. Lehman	Screening and grading equipment.
720	Vascoloy-Ramet Corp.	R. O. Moore	Complete line of carbide tipped mining tool bits including various sizes of masonry drills.
721	Barber-Greene Co.	H. W. Newton	Complete line of permanent conveyors will be presented in photo-mura display.
724	Allen-Sherman-Hoff Pump Co.	W. B. Stephenson	Two or three newly designed Hydroseal pumps. Company men will answer all questions.



While they last . . .

You can get reprints of outstanding technical articles appearing in E&MJ over the last two years at no charge. Pick them up at the E&MJ booth—No. 1009.

BOOTH	COMPANY	MAN IN CHARGE	FEATURES
725	Ludlow-Saylor Wire Co	John F. Staffens	Samples of industrial wire cloth, wire filter cloth, and a variety of square-opening and long-opening woven wire screens. Model shows fine-mesh wire cloth with hook-stripped edges for easy application on vibrating screens.
729	Marion Power Shovel Co.	Robert J. Lick	Complete descriptions and specifications on each machine will be available, with several representatives on hand to answer questions.
800-801	United States Steel Co. (American Steel & Wire Div.)		Wire rope, slings, Amerclad electrical cord and cable, power rail bonds.
805-809-904-908	Westinghouse Electric Corp.	J. R. Fulton	Pantomine showing benefit derived from using the company's goods and services. Also portable switchhouse, power center and selenium rectifier.
808	John A. Roebling's Sons Co.	Albert Neroni	All types and sizes of wire rope used in mining operations, plus electrical wire and cable.
812	Timken Roller Bearing Co.	Peter Poss	Timken tapered roller bearings, rock bits, alloy steel and seamless tubes.
813	Link-Belt Co.	L. O. Millard	An arrangement of belt conveyor troughing idlers—standard, rubber-tread impact and belt training, and steel roll and rubber-tread return. Also a double-deck operating CA concentric action vibrating screen.
816-820	General Electric Co. (Construction Materials Div.)	Otto Cerny	Wires and cables for the mining industry.
816-820	General Electric Co. (Apparatus Div.)	G. A. ReQua	Newly designed high torque slusher hoist motor; new motor control center; new mine communication system; plus a service shop demonstration; an exhibit on mine lighting; a mine cable display; a Bureau of Mines approved motor; and the new gas turbine and its application to the mining industry.
821	National Malleable & Steel Castings Co.	H. H. Smith	NC-1 truck for mine cars and the new reduced-size Willison automatic coupler for small cars. Also steel pallets (including various types of grate bars) for sintering machines, and steel ore grinding balls.
824	Stearns-Roger Mfg. Co.	D. L. Chow	Live demonstration of the Utiliscope, wired television for industrial use.
825	Du Pont de Nemours & Co.		Primacord MS connectors for short delay blasting in open pits, Thermalite Ignitracord for rounds fired with safety fuse and caps, and condenser discharge blasting machines.

MINING SHOW

BOOTH	COMPANY	MAN IN CHARGE	FEATURES
828	Hardinge Co., Inc.	F. W. Lutter	Working glass model of the Tricone mill. Also a glass model of a Ruggles-Coles rotary drier and a Hardinge Constant-Weight feeder, both in operation.
900	Northwest Engineering Co.	G. C. Williams	Colored photos of excavating and material handling machinery.
901	Euclid Road Machinery Co.	V. L. Snow	Both 22 and 34-ton rear-dump Euclids.
905	Atlas Powder Co.	J. H. Dannenberg	Machine gun photographs showing blasting techniques and advantages of Rockmaster blasting system. Also history of mining explosives with samples.
909-913-917	Western Machinery Co.	R. W. Hernlund	Visitor can operate spiral and lifting device on classifier. Also operating model of HMS plant; cut-away Fagergren flotation machine; and an operating lab display of new attrition machine.
912	Socony Vacuum Oil Co., Inc.		
920	Buda Co.	H. H. Cohenour	Four heavy-duty diesel engines and one diesel-electric generator set. Three of the diesel engines will be equipped with torque converters.
921-1020	Pioneer Engineering Works, Inc.	W. A. Rundquist	Operating scale model of crushing and screening plant.
924	American Wheelabrator & Equipment Corp.	L. L. Andrus	Cut-away model of full-sized No. 5 model 112 Dustube dust collector, and photographs of dust collection systems in mining and metallurgical installations.
925	Cardox Corp.	T. E. Holton	Underground and surface AugerMiners and Cardox™and Airdox non-explosive mining methods.
928	Christensen Diamond Products Co.	W. I. Harris	Core bits, casing shoes, casing bits, pilot bits, concave bits and reamers. Also a display showing the steps required in the manufacture of a diamond bit.
929	Ohio Brass Co.	J. H. Sanford	Trolley wire fittings and materials for high-speed current collection; roof bolting materials; and fused trolley taps.
1004	Bixby-Zimmer Engineering Co.	Ray L. Kaga	Operating scale model vibrator showing the method of mounting and use of company's round rod all-welded stainless steel screens.
1005	Armco Drainage & Metal Products, Inc.	F. R. Randle	Full-scale tunnel liner; fan duct and explosion door; sheeting; Flex-Beam guard rail; and a model Steelox building.
1008	Harnischfeger Corp.	George W. Hoskins	Operating scale model of a P&H excavator; operating model of Magnetorque swing clutches; two Ziplift hoists; new P&H DC 300 rectifier welder; and low hydrogen electrode display board.
1012	Kennametal, Inc.	E. H. Johnson	Three-Point rock bits, together with regular chisel bits. Approximately 20 different tool styles used throughout the metal and nonmetallics industry.
1013	E. J. Longyear Co.	Harry A. Kurtze	Diamond drilling equipment, bore-hole surveying instruments, and the Arvela Magnetometer.
1016	Link-Belt Speeder Corp.	D. W. Lehti	Fully-operating 1-in. to 1-ft. scale model of a 2 yd. K-375 shovel-crane, operating with shovel and dragline attachments under simulated stripping and loading conditions.
1017	Cleveland Worm & Gear Co. Farval Corp.	D. H. Rowe	Cleveland Speedaire fan-cooled worm gear speed reducer cut-away to show internally ribbed, double wall construction, and both manual and motor-operated Farval centralized systems of lubrication.
1021	Victaulic Company of America	R. W. English	Pipe couplings ranging from ¾-in. through 60-in. pipe sizes, fittings and plug valves, Vic-Groover pipe tools.
1024	Herb J. Hawthorne, Inc.	Earl M. Weaver	Hawthorne Blue Demon rock cutter replaceable blade exploration drill bits 1 ¼-in. to 10-in.
1025	Gates Rubber Co.	J. Chiles	Vulco ropes, rubber-faced steel plate, and mine hose.
1102	White Motor Co.	B. M. Myhre	Gasoline engine; working model of Sterling-White Super Traction differential; off-the-highway dump with fixed planetary gear type rear axle.
1106	American Manganese Steel Div.	G. Ward	Working model of materials handling pump; renewable lip dipper model; double wave ball mill liner; repointer bars for dipper teeth; and hard-facing welding rod.
1116	Denver Equipment Co.	C. V. Johnson	Operating Denver Sub A Super Rougher flotation machine with double impeller and low-level froth overflow on both sides; Deco automatic sampler; and a Denver cone-type reagent feeder.
1118	Dings Magnetic Separator Co.	R. J. Haskin	Crossbelt high intensity magnetic separator for the concentration of weakly magnetic substances; a wet process separator for concentrating magnetite and taconite ore; and a rectangular magnet for removing tramp iron.
1122	Mine & Smelter Supply Co.	D. J. Drinkwater	Literature, pictures, and models of ball and rod mills; tables; pinch valves; filters; pulverizers; grinders; crushers and density controllers.
1126	Colorado Iron Works Co.	H. P. Kautz	Literature, pictures, and models of: Lowden driers, Skinner roasters, Akins classifiers, densifiers and separators.
1130	Sheffield Steel Corp.		How Moly-Corp. grinding balls are used around the world.
1201-1207	Stoody Co.	R. S. Thompson	A Leader automatic welding machine, rebuilding with "toody wires typical worn parts common to mining operations, plus exhibits of mining equipment that has been hard-faced.
1204	Blackhawk Mfg. Co.	V. V. Dyke	Complete line of hydraulic hand jacks and Porto-Power equipment. Also line of special purpose rams, pumps, hoses, valves and power units. "Idea Book" will be given to visitors.
1208-1210	Master Builders Co.	B. R. Wood	Abrasion and other tests of the Masterplate ironclad concrete floor and ordinary concrete floors, and displays which demonstrate advantages of Embeco nonshrink mortar for grouting machinery and heavy equipment.
1209	Texas Co.	C. W. Theal	Revolving gear wheel displaying Texaco industrial lubricants.
1211	W. O. & M. W. Talcott, Inc.	M. W. Talcott	Conveyor and clinching belt fasteners for all types and sizes of flat rubber transmission and conveyor belting.
1212-1242-1313-1353	Frank G. Haugh Co.	R. P. Wiggers	Payloader and four-wheel drive. See electrically operated scale model Payloader and display of toy Payloaders.
1213	Mosebach Electric & Supply Co.	John C. Loy	Complete line of trolley line material, power rail bonds, and also Mesco shock absorbers and Mesco hydraulic brake adjustors.
1215	Broderick & Bascom Rope Co.	T. C. Glazebrook	Samples of wire rope and slings.
1216-1218	Easton Car & Construction Co.	G. D. Fraunfelder	Will feature the Easton side-dump idea in off-highway hauling.

BOOTH
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PROG

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S. H. Willis

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H. E. Ferna

THURSDAY,

9:45 am UR
ATOMIC E
Developments
Blair Burwe
Progress in A
Henry D. S
Comm.

OTH	COMPANY	MAN IN CHARGE	FEATURES
19-1221	American Mine Door Co.	Chas. Vignos	An installation of the Canton Car Transfer operated to show how any number of cars can be by-passed on a single track. Also a Mighty Midget rock duster and an automatic switch thrower.
	Morris Machine Works	W. M. Mercer	A 2-in.-type R slurry pump to demonstrate ease of dismantling and accessibility of parts.
	Sterling Steel Casting Co.	F. F. Rhine	Ore car wheels as well as miscellaneous steel castings.
05	Colorado Fuel & Iron Corp.	C. E. Golson	One of Denver's unofficial hosts, CFI will establish a rest area plus competent secretarial service for those who desire it.
09-1311	General Motors Corp. (Detroit Diesel Engine Div.)	R. V. Baxley	Diesel engines and torque converters with oil-filled motorized plastic model showing operating features and activated display of GM fuel system.
10	W. S. Tyler Co.	J. L. Peterson	Electrically-heated Ty-Rock screen, plus samples of woven-wire screens, a Ro-Tap testing sieve shaker, and standard screen-scale testing sieves.
16	Haynes Stellite Co.	J. W. Todd	Hastelloy alloy parts to resist corrosion in ore plants, tungsten carbide inserts for detachable drill bits, and hard-facing materials.
	Western Gear Works Pacific Gear & Tool Works South Western Gear Works	Peter DeRegt	Gears, speed reducers and increasers, gear motors, torque converters, special transmissions, couplings and cone gear type reducers.
	Santa Fe Tank & Tower Co.	L. R. Obert	Scale models of wood tanks for mining plus slides of wood stave pipe installations, gas washers and cooling towers.
	Pennsylvania Crusher Co.	Robert A. Adams	Complete line of crushing and grinding equipment.
	Colorado Builders' Supply Co.	E. C. Berry	Detailed scale model of various types of construction projects.
	Universal Dredge Manufacturing Co.	Albert Hack	Universal air trammer, compressed air locomotive.
02-1404	Murphy Diesel Co.	Paul Schnetzky	One diesel power unit and one generator set, with cut-aways of the governor, cylinder head, connecting rod, piston, water pump, oil pump and injector.
	Tool Steel Gear & Pinion Co.	J. C. Seeger	Cross-section samples of hardened gears, pinions, sprockets, sheave wheels, shafts and other products for mining.
10	Stearns Magnetic, Inc.	R. H. Koehler	Equipment for tramp iron removal and Heavy-Media recovery. Laboratory model of a Ring Type magnetic separator in operation.
	National Fuse & Powder Co.	V. R. Martin	Brands of the company's safety fuse. Also blasting accessories.
13	Morse Bros. Machinery Co.	Harold N. Grimes	Two cell Jetair flotation machine; laboratory size Trueline rake classifier; and scale model of new concentric thickener.
	Electric Steel Foundry Co.	C. E. Haney	Specialty alloy steel castings for corrosion, heat and abrasion resistant service.
	Aero-Coupling Corp.	C. W. Sawhill	Flexible hose, hose assemblies, hose fittings, self-sealing couplings and breakaway couplings.
	Hendrick Manufacturing Co.	T. A. Warner	Samples of perforated metal screens.
	A. Leschen & Sons Rope Co.	H. L. Waltman	Samples of all types and constructions of wire rope used in metal mining, including a section of 3-in. dragline rope. Various types of wire rope slings available for close examination.
	Farmers Engineering & Manufacturing Co.	W. P. Place	Equipment for complete underground, shaft, crane and surface communications.
	Aero Service Corp.	G. L. Hess	Lots of evidence on how Aero mapping & exploration saves time and money.
	Bethlehem Steel Co.	J. R. Ulrich	Roof bolts, steel ties, armored ties, mine frogs, wire rope and wheels.
	Bemis Bro. Bag Co.	I. D. Teter	Flexipipe ventilation tubing with various methods of hanging the tubing and different types of couplings used.
	American Brattice Cloth Corp.	D. B. Mikesell	New inflatable brattice, Mine Vent tubing with its demountable coupling, and ABC brattice cloth.
	Dart Truck Co.	C. F. Barber	Extra-heavy duty mining truck complete with body and hoist, heavy duty planetary type rear axle, 350 hp. diesel engine, a 3-stage hydraulic torque converter. Also cut-away sections of the axle and other parts.
	Vulcan Iron Works Co.	Chas. Chase	Portocut chain saws; mine hoists; scraper hoists, and a one-piece manganese steel scraper.
	United States Steel Co.		Wire rope, rails and ties, floor plate, corrugated roofing and siding, alloy steels and the high point, the Long Aligner.

OGRAM *(Continued)*

pm Special Conference on Strate Minerals
I. Williston, chairman

pm Special Conference on Mining
pm
E. Fernald, chairman

RSDAY, SEPTEMBER 25

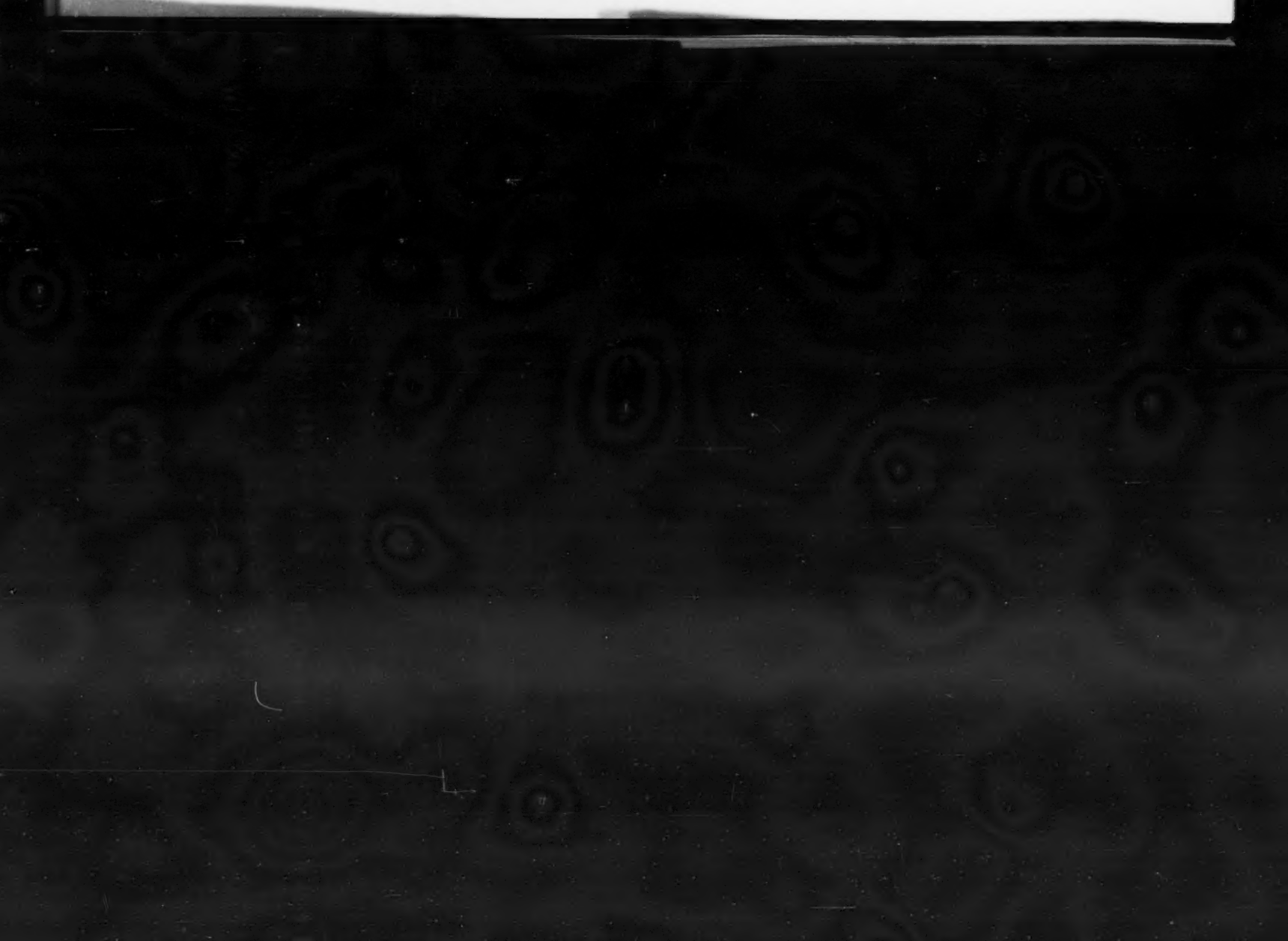
m URANIUM MINING—
OMIC ENERGY
ppments in Uranium Mining
r Burwell, Minerals Eng. Co.
ss in Atomic Energy
ry D. Smyth, U. S. Atomic Energy

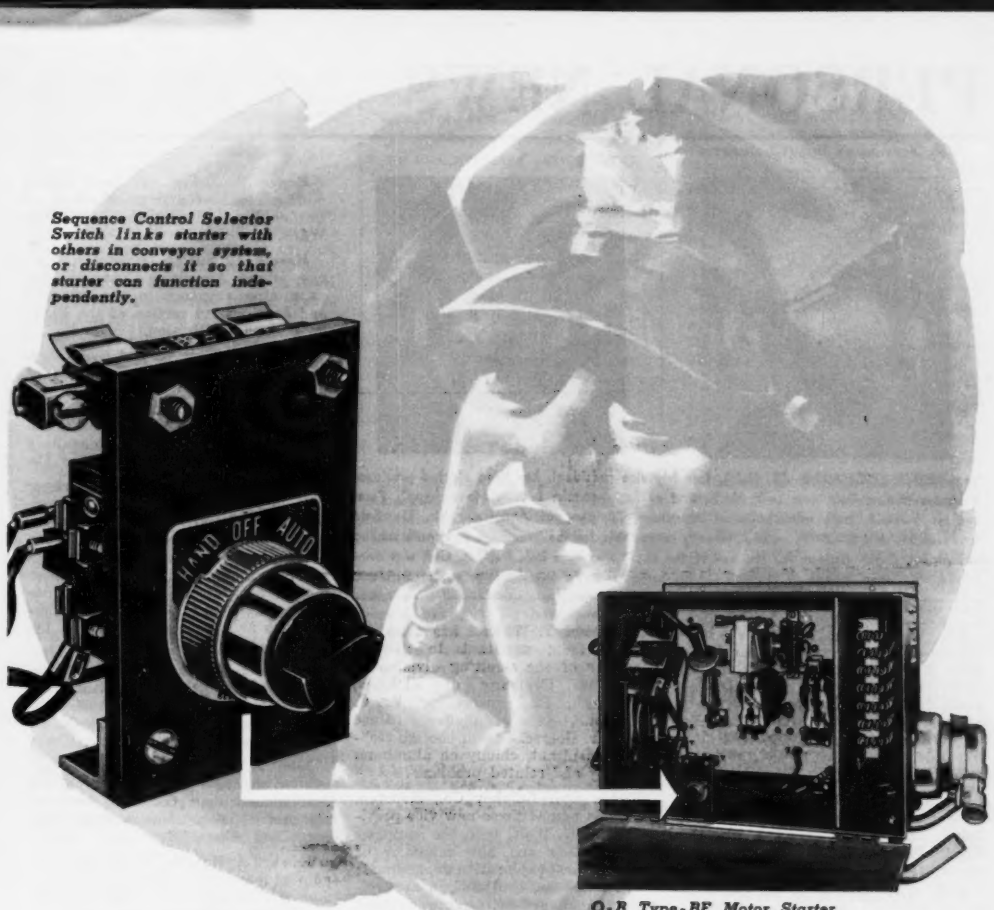
Proposed Atomic Energy Plans for Nevada Mine Development
Hon. George W. Malone, U. S. Senator, Nevada
Report of Resolutions Committee

11:00 am PROSPECTING AND EXPLORATION
J. W. Vanderwilt, chairman
Geophysical Prospecting
G. E. Maillot, Phelps Dodge Copper
The Prospector—Still the Footsoldier of Mineral Exploration
Miles P. Romney, Utah Mining Assn.
Aerial Exploration

2.00 pm NEW METALLURGICAL PROCESSES
The Chemico Process for Metal Extraction
Maj. Gen. W. A. Porter, Chemical Construction Co.
Zinc Recovery by the Sterling Process
W. N. Peirce, New Jersey Zinc Co.
Treating Western Manganese Ores
C. H. Schack, J. V. Batty, U.S.B.M.

2:00 pm ROCK BREAKING
Choosing Proper Drilling Equipment
Clarence Kravig, Homestake Min. Co.
Discussion A. E. Adami, Anaconda Copper Mining Co.; M. W. Hawkesworth, Western Rock Bit Co.; W. P. Crawford, Phelps Dodge Copper Corp.
Alloy Hollow Drill Rod
R. W. Person, W. H. McCormick, Crucible Steel Company of America
Discussion: Andrew J. Zinkl, Shattuck-Denn Mining Co.; J. Fred Johnson, American Smelting & Refining Co.
Blasthole Drilling at Tennessee Copper
Ezell Flournoy, Tennessee Copper Co.





Sequence Control Selector Switch links starter with others in conveyor system, or disconnects it so that starter can function independently.

O-B Type-BF Motor Starter equipped with Sequence Control Selector Switch and Reverse Switch Interlock.

A "TRAFFIC COP" FOR YOUR CONVEYOR SYSTEM!

All units in your conveyor system will work in unison with O-B Interlocked Sequence Control. Room conveyors load out only when gathering conveyors move forward. Or, if the gathering conveyor is reversed, room conveyors stop automatically, to prevent coal from piling up at the wrong end. By interconnecting the starters in a conveyor system, Interlocked Sequence Control centralizes control at selected points. Conveyors inby from any of these points can be controlled without disrupting production from other places.

Several O-B Motor Starters can be equipped with Interlocked Sequence Control. They are Types BF, BF-3, BH-3 and BH-4. Only two accessory parts are needed -- a Selector Switch and a Reverse Switch Interlock.

No matter how widespread your conveyor system may be, O-B Interlocked Sequence Control will do an effective policing job, keeping coal moving in the right direction. Let us help work out a circuit for your own conveyor setup!

Ohio Brass

MANSFIELD OHIO, U.S.A.

CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

4298-M

PERSONAL NEWS

LAWRENCE LITCHFIELD, JR. (left), formerly vice president, has been elected president of Alcoa Mining Co., New York, N. Y., and of Surinaamsche Bauxite Maatschappij, Paramaribo, Surinam, both subsidiaries of Aluminum Company of America. Mr. Litchfield succeeds FRANK B. CUFF, retired. Greatly responsible for the expansion of bauxite mining in Surinam, Dutch Guiana, for the use of the U. S. aluminum industry, Mr. Cuff was decorated by Queen Juliana of Holland for his contribution to the development of Surinam.

Dr. C. Manning Davis has been appointed head of the analytical section of the research laboratory of The International Nickel Co., Bayonne, N. J. Dr. Davis was formerly associated with the Mellon Institute at Pittsburgh, Pa.

J. H. Cazier, Bagdad, Ariz., has resigned as general superintendent of Bagdad Copper Corp. to devote full time to his partnership with **E. A. Scholz** on the Copper King, and the Black Pearl and Phillips tungsten mines.

C. H. McNaughton, Jr. has left New Jersey Zinc Co. to return to Michigan College of Mining and Technology.

John A. Patterson is now project chief for the exploration branch, Atomic Energy Commission at Grand Junction, Colo.

James R. Johnson has returned to Libby, Mont., as mine engineer with the Zonolite Co. after 14 months in the U. S. Marine Corps.

Allen B. Hollett has resigned as assistant chief engineer with Cleveland-Cliffs Iron Co. on the Mesabi Range to join AS&R's mining department in New York, N. Y.

Joseph N. Rumble has joined U. S. Vanadium Co. as metallurgical engineer in Bishop, Calif.

Harry J. Wolf, consulting engineer of New York, N. Y., has been investigating sulphur and gold deposits in Southern California.

D. S. Dinsmoor, vice president in charge of research and development, has been appointed to the board of directors of American Potash & Chemical Corp. Mr. Dinsmoor was formerly vice president of Monsanto Chemical Co.

Raymond T. Whitzel has been advanced from assistant to general manager of the smelting division of Aluminum Company of America, Pittsburgh, Pa., succeeding **V. C. Doerschuk,** general manager since 1935. Mr. Doerschuk will become technical consultant, chiefly on aluminum smelting and related problems.

Texas Gulf Sulphur Co., Houston, Tex., has named three new vice presidents: **A. G. Wolf,** with the company for 33 years and now manager of the geological exploration department; **C. O. Stephens,** construction supervisor and manager of the largest plant erected for sulphur extraction from sour gas and now manager of the gas department; and **H. W. Strickland,** in charge of the Houston office legal department and assistant to the president.

Warren E. Fisher, Ishpeming, Mich., head of the geological department of Inland Steel Co., has resigned to join Kennecott Copper Co. as field engineer. With **C. H. Burgess,** district geologist, he will establish a district office covering Canada to Mexico and the Rocky Mountains to the Appalachians.

Robert E. Vervaeke, manager of U. S. Gypsum Co.'s plant at Evans, Wash., for 10 years, resigned to join Quincy Corp., Quincy, Wash., as vice president. His successor at the Evans plant is **Macy Smith,** Falls Village, Conn.

Frank Eichelberger, president, Vermont Copper Co., Spokane, Wash., has been on an inspection of mines in Korea, reputedly to negotiate on a contract for management. He was accompanied by **Blair Burwell,** president, Minerals Engineering Co., Grand Junction, Colo.

Roger N. Miller has been named mining engineer and metallurgist of Border Lord Mining Corp., Seattle, Wash.

Harold L. Sutton, Brewster, Fla., has joined American Cyanamid Co. as mining engineer in the research and development section of the Florida Phosphate Division.

John C. Russell, of Old Greenwich, Conn., has accepted an appointment as chief research metallurgist for Rhodesian Anglo American Ltd. at Kitwe, Northern Rhodesia. Mr. Russell was formerly in the consulting engineering department of Dorr Co.

W. J. Tough has become manager of a new company, Nordisk Mineselskab A/S, formed by an association of the Danish Government, a group of businessmen, two large Swedish mining companies, and a Canadian mining company to investigate mineral occurrences and mine-making possibilities in a concession lying on the east coast between 70 and 74.30.

Ralph C. Holmer, formerly teaching at Colorado School of Mines, has joined the exploration staff of Kennecott Copper Corp., New York, N. Y., as chief geophysicist.

John J. O'Neill, Jr. has been appointed manager of the research and development department of the explosives division of Olin Industries, Inc., East Alton, Ill.

Edward A. Hassan, Jr., has been appointed manager of the Kaiser Aluminum & Chemical Corp. raw materials department in Oakland, Calif. He succeeds the late M. B. Lovelace, and was former administrative engineer.

Robert D. Longyear, president, E. J. Longyear Co., has returned to his Minneapolis, Minn. home after a four months' trip through Africa, Europe, England, and Scotland.

James Westfield has been appointed chief, Health and Safety Division of the Bureau of Mines, Washington, D. C. Mr. Westfield has been with the Bureau for 24 years.

Jay B. Clitheroe, formerly with Oldbury Electro-Chemical Co., Niagara Falls, N. Y., has joined Booth Engineers, Salt Lake City, Utah, as manager of development and chemical engineering.

Five vice presidents and two assistant vice presidents have been elected at Cleveland-Cliffs Iron Co., Cleveland, Ohio. Vice presidents named are: **F. A. Bell,** counsel for the company; **H. Stuart Harrison,** company treasurer; **J. H. Kerr,** company secretary; **J. S. Wilbur,** manager of ore sales; **Harrold Gobeille,** manager, marine department. **D. R. Forrest,** assistant to the president, and **Fay-**

ette Brown, Jr., assistant manager of the mining department, have been named assistant vice presidents. W. A. Sterling, in charge of mining operations, and V. P. Geffine will continue as vice presidents.

H. C. Burrell, chief geologist of the exploration party which made the Cerro Bolivar discovery in Venezuela, has been appointed manager of raw materials development for Columbia-Geneva Steel Division of U. S. Steel Co., with headquarters in San Francisco, Calif.

David E. Lilienthal, formerly director of TVA, is now president of Minerals Separation North American Corp., Lakeland, Fla. Mr. Lilienthal succeeds Dr. Seth Gregory, 25 years with the company, who will continue as a consultant. William Trotter, after long service in the flotation field, has retired from active direction of research, but is also continuing as a consultant.

Dr. Ernest W. Greene, resident manager of the research laboratory for Minerals Separation North American Corp., Lakeland, Fla., is now executive vice president and director of research; the new resident manager at Lakeland laboratory is Wesley M. Houston, formerly its chief engineer; Earl H. Brown has been appointed assistant to Dr. Greene, devoting a major portion of his time to iron ore; Albert H. Pedler, resident manager, is now in charge of the company's laboratory for iron ore flotation, Mesabi Range.

James B. Duke, long connected with development work in phosphate and potash ores for Minerals Separation North American Corp., has been named resident engineer in charge of the new office and laboratory at Carlsbad, N. M.

John C. Havard, chief engineer of mines for United States Gypsum Co., Chicago, Ill., has been appointed assistant resident manager at Potash Company of America, Carlsbad, N. M.

Dr. John Elliot Allen, head of the geology department, college division, of the New Mexico Institute of Mining and Technology, is head of a survey party to study and map the geology of 450 sq. mi. in the Navajo Indian reservation under a U. S. Bureau of Indian Affairs contract.

George L. Dickinson, formerly associated with the El Paso Testing Laboratories, has announced the opening of Dickinson Laboratories, El Paso, Tex. His sons George C. and Robert L., will be firm members.

Donald C. Kimball, mining engineer, has been appointed superintendent of the Coons-Pacific Co. concentrating plant near Eveleth, Minn.

James W. Van Evera, Crosby, Minn., was awarded an honorary doctor of engineering degree from Michigan College of Mining & Technology, Houghton, Mich.

Mason L. Bingham, Portland, Ore., has been named chairman of the governing board of the Oregon State Department of Geology and Mineral Industries. Other members: H. E. Hendryx, Baker; and Niel R. Allen, Grants Pass.

The Atomic Energy Commission seeks top-level metallurgical engineers with professional training and operating experience in ore processing. Positions involve administration of uranium production programs. Salary range; $7,000-$10,000. Positions are located in Washington, D. C. and in the field. Interested applicants should address inquiries to George M. Gableman, Chief, Personnel Operations, 1901 Constitution Avenue, N. W., Washington 25, D. C. and enclose a background statement.

Richard C. Wightman, mining captain at M. A. Hanna's Clifton mine, New York, N. Y., has been transferred to the Bengal mine, Stambaugh, Mich., as operating engineer.

Henry E. Reed, Jr., has been appointed assistant geologist for the mineral development department of the Great Northern Ry. Co., Williston, N. Dakota.

Floyd H. Lee, mining captain with Ozark Mining Co., Iron Mountain, Mo., has been appointed assistant superintendent, and Bruno Sestito, foreman, has succeeded him.

Anton Tancig, Chisholm, Minn., mechanical superintendent for Snyder Mining Co., has retired after 44 years. He is credited with being first to suggest electric power shovels for Mesabi open-pit mines; classifiers in washing plants; and electric motor-driven tugger hoists for underground mines.

James L. Lake, metallurgist, Duluth, Minn., has resigned from Oliver Iron Mining Division's research department to join United States Vanadium Co., Grand Junction, Colo.

W. P. Morris, Virginia, Minn., assistant supervisor of ore beneficiation with Oliver Iron Mining Division, has joined Combined Metals Reduction Co., Salt Lake City, Utah.

Robert M. Moyle, Hibbing, Minn., assistant district engineer with Oliver Iron Mining Division, has been transferred to the general mining department in Duluth. Milton R. Sermon succeeds him.

Rollin Smith, manager of Titanium Metals, Henderson, Nev., and A. E. Millar, Anaconda Copper Corp., Yerington, have accepted membership in the Mackay School of Mines advisory committee, University of Nevada.

Officers of the recently organized Iron County Engineers' Club, Michigan, are: Philip D. Pearson, superintendent, Inland Steel Co.'s Sherwood mine, Iron River, president; Jack Morrow, vice president; Richard Brewer, Stambaugh, secretary; and John Torreano, Crystal Falls, treasurer.

O. T. Berge, pit foreman at the Mahoning mine for Pickands, Mather & Co., has been appointed engineer at the Erie Mining Co. operations at Aurora, Minn.

Morris V. Mielke, assistant concentrating engineer at the Oliver research laboratory in Duluth, has been appointed superintendent in charge of the company's Exacta plant, Virginia, Minn.

Wynn T. Sullivan, previously engaged in market research and promotion activities for *Steel*, has been appointed advertising manager of Heyl & Patterson, Inc., Pittsburgh, Pa.

Donald E. Mathewson, Phillip H. McCary, Jr., and Joseph F. Brown, Jr., geologists, have joined the U. S. Atomic Energy Commission, Division of Raw Materials, at Grand Junction, Colo.; Dale L. Roberts and Charles P. Bromley, geologists, are at the Denver Exploration Branch; and H. Clyde Davis, geologist, and Stephen R. Steinhauser, mining engineer, are at Salt Lake City, Utah.

Dr. C. Stanley Smith of Chicago, Ill. will receive the Francis J. Clamer Medal of The Franklin Institute on October 15 for his metallurgical contribution to the development of atomic energy during and since World War II.

OBITUARIES

Hermann Brill, head of the board of directors of Norddeutsche Affinerie, Hamburg, Germany, passed away on July 27 at the age of 55. He had been with the company for 26 years.

Martin G. Basch, chief engineer of Easton Car & Construction Co., died on July 14 in Easton, Pa. at the age of 71.

James Benjamin Ward, of Knappen-Tippetts-Abbett-McCarthy, consulting engineers of New York, N. Y., died on July 9 at 38 in Port-au-Prince, Haiti, while working as chief geologist on the Artibonite River development.

Charles E. Basso, of Yonkers, N. Y., passed away at 51 on July 17 in La Posta, Bolivia, where he was general superintendent of the Patino Mines.

Perry B. Wickham passed away at 68 in Oakland, Calif., on July 21. Superintendent of Almeda Consolidated Mining Co., founded with his father, Mr. Wickham did field work. He then bought and operated the Ashland gold mine, now closed, the Shorty Hope mine, and the Greenback mine.

Byron C. Riblet died in Spokane, Wash. at 87. Mr. Riblet graduated from the University of Minnesota, was president of Riblet Tramway Co., builders of some of the longest and highest tramways in the world.

NEW BOOKS

Red Metal. The Calumet & Hecla story by C. Harry Benedict. Published by the University of Michigan Press, Ann Arbor, Mich. Pp. 257. Price $4.

Here we have the story of Calumet & Hecla, and in large part that of the Copper Country, interwoven as they are so that one cannot be told without the other—the history of a hundred years. It is fitting that the storyteller is Mr. Benedict, whose achievements in hydrometallurgy contributed so greatly to the well-being of the company for more than three decades and a half.

The fact that the copper in its ores is in metallic form has set the Copper Country apart from other copper areas. This circumstance has underlain the chief difficulties that arose in mining and treating the ore. At the same time it simplified the final procedure in the production of the metal.

Mr. Benedict's narrative mentions the early isolation of the Copper Country from rail and telegraph, the native Indian's ignorance of the existence of copper except for a few fragments and boulders of varying size, the survey made by Douglass Houghton and his predictions as to mineral possibilities. Early activities revealed three copper districts, each centering on a mine—Eagle River (Cliff mine); Portage Lake (Pewabic, Quincy and Huron properties), and Ontonagon (Minesota mine, so spelled). Up to the end of 1865, 300 companies had been organized, only 1% ever paying regular dividends. In all this period the big bonanza—the Calumet conglomerate lode—remained undisclosed.

The remarkable activities of E. J. Hulbert that led to his disclosure of the Calumet conglomerate, the acquisition of the important ground, and the organization of the Calumet and the Hecla companies are given much attention. The eventual thwarting of Hulbert's ambitions will excite the reader's sympathy.

In the regime that followed, the Calumet and the Hecla companies were under the control of Quincy A. Shaw, in Boston, and Alexander Agassiz at the mines. The companies were consolidated in 1871, a merger that was to be unchanged for years.

Marvelous growth featured the period from 1871 to 1900 during which the bonanza was exploited. It was during this time that the huge mining machinery was built, the great shafts were sunk and plants provided that long made the Copper Country the great showplace of the mining world. A smelter was built next to the stamp mill at Lake Linden. Labor was plentiful and cheap. Much copper went into the tailings. It was also in this era that the episode of the Secrétan Syndicate took place. This was in the mid-eighties and was brought about by the tremendous production of metal that developed in the period.

The bonanza era finally ended. The 1900 annual report of C.& H. showed that copper in the ore was 52.1 lb. per ton, compared with 92.6 lb. 20 years before. Moreover, in spite of a lower cost per ton of rock the cost per pound of copper produced was mounting steadily. Attention was now to be focused on the copper in the sands that had been rejected in milling over many years. It was 1915 before a plant was put into commission that would recover this copper by leaching with ammonium carbonate, the achievement largely of Mr. Benedict. The profit on this work through 1949 is put at over $30-million.

In 1901, at the start of the new era, James H. MacNaughton had become manager and set about improving the situation. Preliminary to attacking the problem of tailings losses, a new sampling plant and a laboratory were built. Experimental flowsheets were made, an extension was built on the Hecla mill. The company experienced what the author calls its first modernization in 30 years.

Under Mr. MacNaughton, the state law now permitting, C.&H. began to acquire the assets of other copper companies in the Peninsula. In 1923 a consolidation was affected and the present Calumet & Hecla Consolidated Copper Co. was born. Mr. MacNaughton, president since 1933, retired in 1941 and was succeeded by A. E. Petermann, Sr. who served three and a half years. E. R. Lovell, who subsequently became president, had already taken charge of the operations as general manager.

Various advantages have accrued from the consolidation of 1923. Further expansion has resulted, with the beneficial diversification of activities under Mr. Lovell that characterizes the Calumet & Hecla enterprise today.

A.H.H.

Titanium. (Gmelins Handbuch der Anorganischen Chemil—8th Edition. System No. 41 complete.) Published in German by Verlag Chemil, GMBH, Weinham, Bergstrasse. A comprehensive, critical, up-to-date review of the geology, geochemistry, metallurgy, chemistry, physics and technology of titanium, its alloys and compounds. It is a "must" for all research and industrial workers. Available through Walter J. Johnson, Inc., 125 E. 23 St., New York 10, N. Y. Pp. 481, 100 graphs. Price $27.20 in wrappers.

Magnesium. (Gmelins Handbuch der Anorganischen Chemil. 8th edition.) Published in German by Verlag Chemil, GMBH, Weinham, Bergstrasse, Germany. This volume covers binary and ternary alloys from Mg-Zn to Mg-Re as well as surface treatment of Mg and Mg alloys. 31 binary and 105 Mg alloy systems of higher order are treated for which the following material is given: phase diagrams, data on intermetallic compounds, production processes, casting methods, structural data, hardening characteristics as well as crystallographic, thermic, optical, electric, magnetic and electrochemical properties. Chemical behavior and corrosion resistance are covered in detail.

For the first time in literature, this volume presents in a systematic manner the many surface treatment processes and methods used by the industry. The material includes chemical and electrochemical treatment methods, metallic coating and other surface treatments applied to Mg alloys. Available at Walter J. Johnson, Inc., 125 E. 23 St., New York 10, N. Y. Pp. 336. Price $23.81.

Gold Metallurgy on the Witwatersrand. By A. King, formerly consulting metallurgist, New Consolidated Gold Fields, Ltd., and 17 authoritative contributors. If you want to know how gold ores are concentrated on the "Rand," here's the answer in complete detail in 447 profusely illustrated pages. Published by the Transvaal Chamber of Mines. Available in the U. S. A. from Hafner Publishing Co., 31 E. 10 St., New York 3, N. Y. Price $12.50.

The Engineers Illustrated Thesaurus. By Herbert Herkimer. Contains 8,000 detailed designs and drawings of mechanical movements, parts, devices, tools and assembled machinery including screws, nuts, clamps, frames, chains, levers, gears, cranes, conveyors, pumps, engines, etc. Published by Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y. Pp. 572. Price $6.

Mining Year Book, 1952. Compiled by Walter E. Skinner. This well-known reference includes authoritative information of 950 important mining companies in all parts of the free world. Items covered under each company include officials, seat of operations, plant, present working results, ore reserves, capitalization, dividends paid. A list of 1,100 mining engineers, managers is presented, as well as a buyers' guide including 590 items. Published by Walter E. Skinner, 20 Copthall Ave., London, E.C.2, Pp. 574. Price $7, post free abroad.

Geology. By O. D. von Engeln, Cornell University, and Kenneth E. Caster, University of Cincinnati. This book is not just another geology book. It has been written to challenge the interest of the cultural course student, and at the same time provide a basic presentation for the student who plans to major in geology. Technical geological terms which the prospective geologist student will have to master (poor fellow) are conveniently set in bold

(*Continued on page 198*)

PRECISION CONTROL MEANS BETTER METALLURGY!

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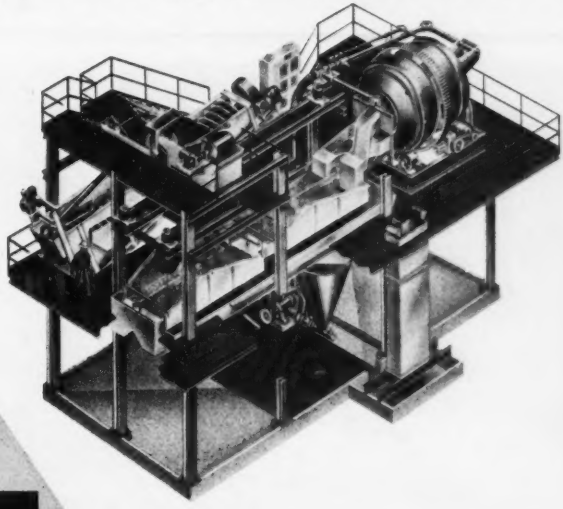
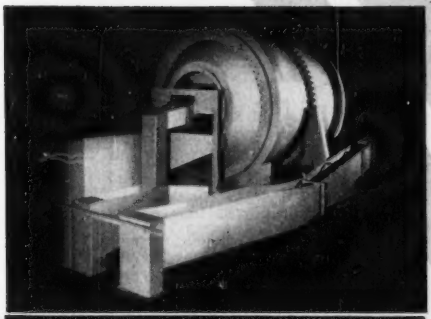
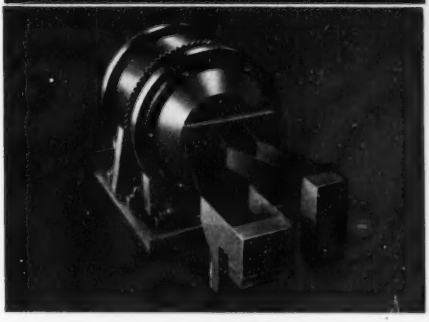
WEMCO design allows accurate control of media density and positive sink removal—assures higher grade concentrate and lower tailings.







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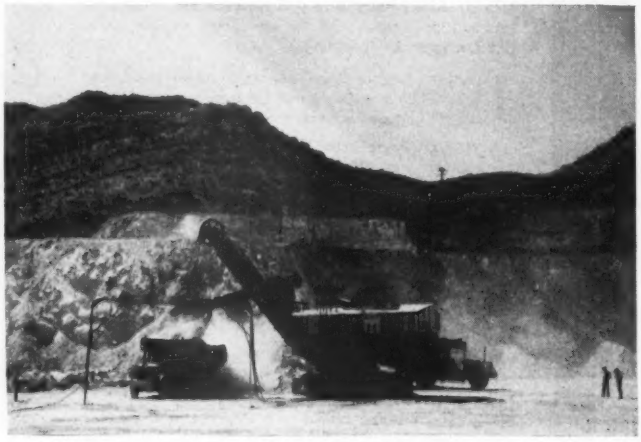
THIS MONTH

COPPER CITIES, 3:00 PM, day shift has just gone, leaving equipment in readiness so that by . . .



. . . 3:12 PM afternoon shift has the job going again.

Stripping Overburden At Miami Copper Co.'s New Copper Cities Pit

MOST OF THE AREA SHOWN in the photograph at the left above will be taken up eventually by the Copper Cities pit in Arizona, where Copper Cities Mining Co., a wholly-owned subsidiary of Miami Copper Co., has been moving about 500,000 tons per month of overburden since June 1951.

Almost identical with Miami Copper Co.'s Castle Dome orebody in tonnage and grade, the Copper Cities orebody is located a short distance northeast of Miami, Ariz. It is easily visible from the highway entering Miami from the east.

Financed in part by an RFC loan, the project represents a total eventual investment of about $16,000,000. It should enter the production stage in the fall of 1954. By then, 20,000,000 tons of overburden will have been removed, and the Castle Dome crushing plant and mill, which Miami is buying from the RFC, will have been torn down and set up again at the Copper Cities site. The last of the ore at Castle Dome will go through the mill in September 1953, leaving about a year to move the 10,000-ton concentrator to its new site on the other side of Miami.

Ore Reserves Total About 33-Million Tons

Ore reserves at Copper Cities total about 33,000,000 tons; overburden will amount to 35,000,000 tons. Equipment, moved over from Castle Dome, includes 9-in. churn drills, a 5-yd. electric shovel equipped with 4½-yd. dipper, and 30-ton trucks.

As the pictures indicate, the ground breaks very fine. Production has run as high as 7,000 tons per shovel shift, but averages close to 6,000 tons for the job thus far. Holes are spaced on 8-yd. centers with a 14-yd. toe. Rock broken averages 69 tons per foot of hole drilled.

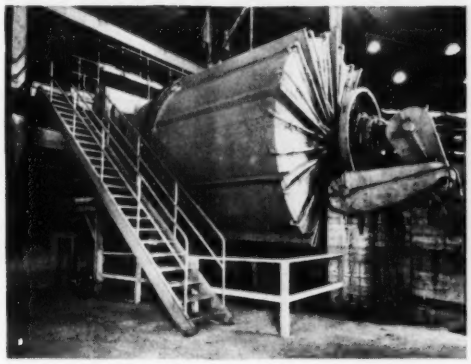
The drills get about 106 ft. of hole per shift with a bit life of 93.2 ft. per sharpening. The trucks have averaged just over 30 tons per trip, and just under 30 trips per shift. Average haulage distance is 0.92 miles.

As reserves diminish at Castle Dome, more equipment will be moved to Copper Cities, and the pace of stripping will be stepped up. Foundations for the new plant are already being installed on the property.

Copper Cities Mining Co. has a contract with the GSA calling for purchase by the government of up to 170-million lb. of copper at 23¢ per lb. out of the first 192.5-million lb. of copper produced if the company is unable to sell it in the domestic market at that price or better.

Stripping at Copper Cities is directed by John Gray, pit superintendent for Miami, and Maynard Stover, superintendent at Copper Cities. R. W. Hughes is general manager at Miami Copper, B. R. Coil is assistant general manager, and J. W. Still is the general superintendent.

IN MINING



Sand Fill Replaces Waste Fill at Inco

SAND FILLING is an important step in International Nickel Co.'s $150-million long-range conversion program from open pit to underground mining. For 20 years, waste has been used to fill stopes. Now sand fill is being piped to the Frood-Stobie and Creighton mines at a rate of more than 3,000 tons per day. Three steps in the operations at the Frood-Stobie are shown here. First the tailings from the Copper Cliff mill are dewatered with the vacuum filter shown above. Then they are shipped in a 78-ton car to the Frood-Stobie mine where the sand is mixed with water to form a pulp of 60% solids. This goes down 6-in. rubber-lined pipe from the surface to the 3,100 level. Stope sections to be filled are bratticed off with burlap as shown at upper right and then filled with the sand pulp which settles to a level surface, filling all parts of the open stope with a firm, rock-supporting mass. Excess water drains through the brattice.

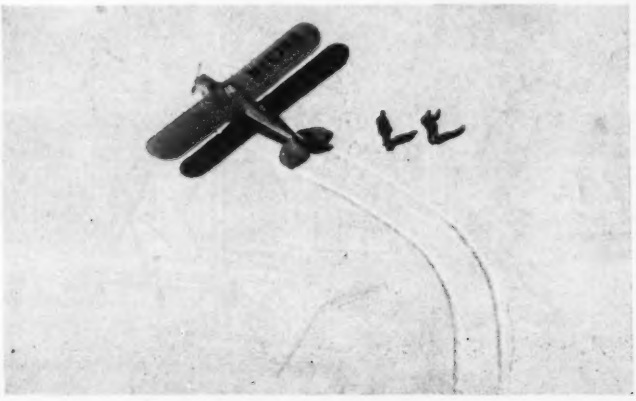
Mine Mill Signs Up Phelps-Dodge

THE INTERNATIONAL Mine, Mill & Smelter Workers have reached an agreement with Phelps-Dodge Corp. on a new wage contract which the union believes should open the way for an industry-wide settlement. The contract was announced August 21.

John Clark, Mine-Mill president, said terms of the contract call for a general wage increase of 8¢ an hour, three weeks' vacation after 15 years of service, and an additional 2¢ an hour to be applied to the common labor rate. Wage boosts are retroactive to Aug. 1. The new agreement has been approved by the Union Wage Policy Committee.

The union president said an agreement also was reached on a pension plan which was negotiated last year. The plan calls for a $100 monthly pension for workers reaching 65 who have 25 years with the company.

Plane to Aid Cascade Sulphur Search



THREE LANDINGS of a ski-equipped Piper Cub on southern Washington's 12,307-ft. Mount Adams have convinced Pacific Sulphur Co. that personnel and light equipment can be flown to the summit where they plan development of high grade sulphur deposits.

The company hired Lt. John Hodgkin, Air Force pilot, who took off from the Hood River, Ore. airport and 15 minutes later put the plane down on the snow-covered peak in the Cascade Range. He found a 2,000-ft. long landing area, with sufficient width.

Next day he made two flights to the summit (see photograph), accompanied by Earl Dean, son of Wade Dean, president of Pacific Sulphur.

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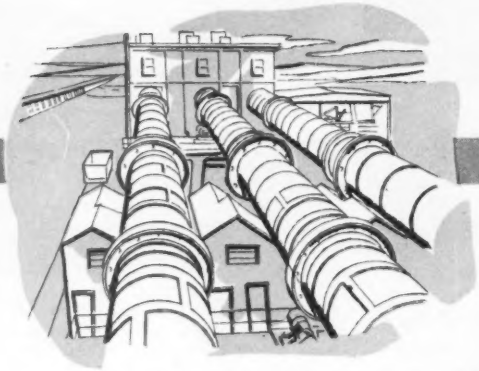

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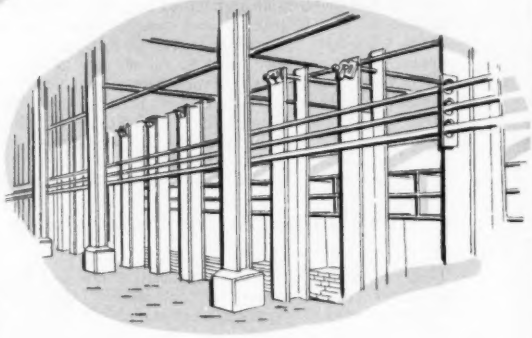
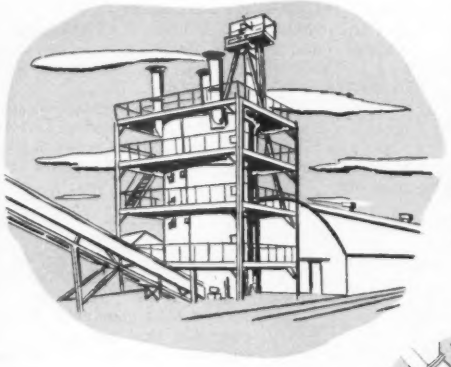
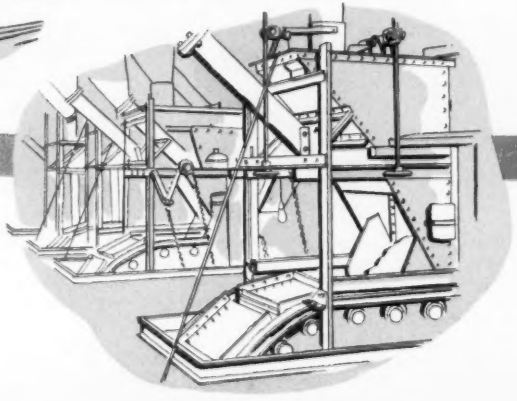
Harbison-Walker refractories comprise the entire range for all sintering and recovery kiln needs.





Harbison-Walker Roaster Brick meet the exacting requirements for every kind of operation.



Harbison-Walker provides super-duty and high-alumina refractories for the most severe conditions in the operation of sintering furnaces.

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metallurgical furnace operation

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From these can be selected the refractory best suited for each particular need in the smelting, reduction, refining and alloying of metals, such as aluminum, copper, nickel, lead, zinc and others.

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IN THE UNITED STATES

ALASKA

★**U. S. Tin Corp.** plans to increase production at operations northwest of Nome, Paul Sorenson, general superintendent, announced. Supplies due in August include a 150-hp. Superior diesel electric unit and 20 concentrating tables. A fairly high-grade orebody following the cassiterite dike about 2,000 ft. to the intersection of the Ida Belle dike will be opened up. Good tin-tungsten values have been indicated through trenching and drilling. The company hopes to run 200 tons through the mill daily to produce about 5 tons of tin and tungsten concentrates containing about 72% tin and 10% tungsten.

★Drilling will start this fall at the **Billy French mine** on Jump Creek, according to Senator Howard Lyng, who has taken over the property. Others operating in the Candle area include Havenstrite Mining Co., employing 20 men at its hydraulicking operations on Candle Creek; Henry Xavier on California Creek; and Fritz Weinard and Son who are hydraulicking on Mud Creek west of Candle.

★Contracts totaling $295,675 have been awarded by DMEA to **Zenda Gold Mining Co.** at Tin City on Seward Peninsula, **Admiralty Alaska Gold Mining Co.** with a nickel-cobalt deposit on Admiralty near Juneau and **Alaska Metals Mining Co.** for a tungsten exploration project in the Fairbanks area. The companies will put up $62,558 for their share in the operations. The latter company is a partnership of Bill Birklid, Elmer Stohl, Melvin Anderson, and Maurice Rafn who expect within two years to have 65 men working in the mine and a stamp mill operating at the **Gilmore Dome tungsten mine** about 30 mi. from Fairbanks. Their government grant will be $133,676, to which they will add $44,558.

★**Alluvial Gold Placers** will only operate the Woodchopper Creek dredge this summer, Harry Ginrich, superintendent, reported. Stripping will be done on Coal Creek.

ARIZONA

★The asbestos industry of Arizona is flourishing, with a gross output of some 500 to 700 tons monthly. Mine owners have organized the Arizona Asbestos Producers Association to deal with freight rates and expansion of present markets. All 12 active mine operators are members.

One proposal being seriously considered by President D. L. Green and the board is selling all Arizona asbestos as "Arizona chrysotile," to

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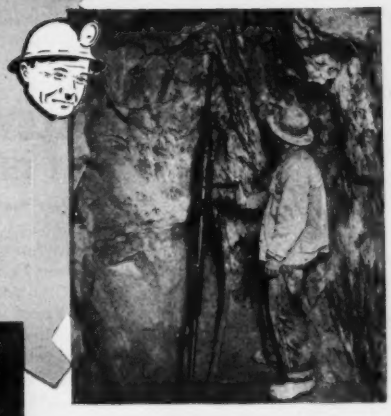

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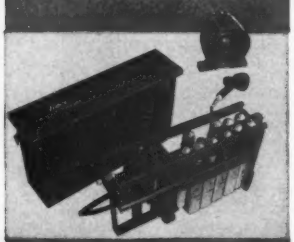

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Arizona *(Continued)*

distinguish it from the competitive Canadian product that contains at least twice as much iron. Asbestos from this area is unique in that it is almost free of the ferrous oxide.

Mr. Green heads the Bear Canyon Mining Co., one of the three largest asbestos producers of Gila County. Barry DeRose of Apache Asbestos Mines is vice president; Jack Neal of Metate Asbestos Co., sec.-treasurer.

A survey completed at the organization meeting showed that the Apache concern is producing approximately 30 tons of asbestos ore each month; Bear Canyon, 100 tons; Fiber King, 20; Metate, 80; Regal, 50; Canadian, 50; Phillips, 100; Pine Top, 20; Lucky Strike-Pueblo, 10; Cibeque, 20; American, 50; Chrysotile, 100. Several other mines under development are expected to enter the productive list this year.

Most of the asbestos has to be separated from waste rock after being mined. Mills for this purpose are operating in connection with the American, Bear Canyon, Chrysotile and Metate mines. Other mills at the Arizona Chrysotile, Enders and Roger Kyle claims, not now productive, treat ores on a custom basis.

★The Salome area is increasing its scheelite production. **George Campbell and Son,** owners of the Bunker Hill mine, have been producing tungsten since 1943. They operate a small mill which yields a 70% WO_3 concentrate. Development is going ahead on two veins, one of which runs 2% WO_3 on a 2½-ft. width, and the other 12% over a 2-ft. width. **George Parker and Herbert Kast,** who lease the Clark Rhodehamel Scheelite property 5 mi. west of Salome, have just moved a compressor and other equipment to the property. **T. E. Warren,** operating the Hidden Treasure gold mine near Salome, has recently shipped a carlot of high-grade gold ore to American Smelting & Refining Co. at El Paso, Tex. Mr. Warren, working on the 150 ft. level, reports that the ore is improving with depth.

★Because all Arizona lead and zinc mines "are operating on the ragged edge," the San Xavier Mine, with a $100,000 monthly payroll, is shutting down operations in southern Arizona.

Arizona ranks second in U.S. zinc production and fourth in lead.

The San Xavier employed 350 men. Arizona mining men, generally, were critical of a situation that showed a sharp reversal in four months from a lead and zinc shortage to a surplus.

H. P. Mills, manager of the Shattuck Denn's Iron King mine in Yavapai County, said his operation was feeling the pinch. "If we were producing only lead and zinc, we would be forced to shut down, too," he said. The Shattuck Denn is the leading state lead and zinc producer, but also produces gold and silver.

W. P. Goss, vice president and general manager of Magma Copper Co.

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Arizona (*Continued*)

at Superior, which is opening the $100 million San Manuel Copper Mine, said that if prices fall much lower Magma would close zinc production and transfer miners to copper mining.

★**Bagdad Copper Corp.**, at Bagdad has been granted $11,134,237 tax benefits on its copper mining operation by the Defense Production Administration. The accelerated tax amortization covers new buildings and exploration work.

★Validity of a general election initiative measure **proposing a 1% production tax on mines** and other mineral resources depleting industries has been challenged by three Arizona mining firms. Protests claim the petitions lack the required 19,523 signatures to qualify the measure for the ballot. Backers of the measure, which would provide a public employees welfare fund, claim more than 23,000 signatures for the petitions.

★The **Universities of Arizona and New Mexico of School of Mines** hold contracts for a $71,500 minerals survey on the 15-million-acre Navajo and Hopi Indian reservations in Arizona and New Mexico. E. D. McKee of the University of Arizona geology department will supervise the Arizona program which will send four and six-man teams into the field to prepare maps for the published report which will be completed by June 30, 1954. Purpose of the study is to locate mineral products which can be put to use for present and future tribal needs and income.

CALIFORNIA

★**The Pilliken mine** in northwestern El Dorado County, inactive many years, is now being operated by Allied Mining Co. and is producing high-grade chromite. The company is shipping a carload of ore weekly to the government purchasing depot at Grants Pass, Ore.

★**The Siskon Corp.** has acquired a lease on the Siskon gold mine 20 mi. north of historic Somes Bar and has made arrangements for construction of a cyanide mill. Anticipated production from the plant is 100 tons of ore daily. Milling grade ore is reported exposed in shallow workings and will be mined in open pits with steam shovels.

★Acquired a few months ago by Anaconda Copper Mining Co., the **Leviathan sulphur property** in the Markleeville area of Alpine County is the scene of big activity. Diamond drilling to determine ore possibilities at greater depth and in ground adjoining the developed area was started last fall.

Sulphur ore will be taken 60 mi. by truck to the sulphuric acid plant Anaconda is building at Yerington, Nev. The acid is to be used in leaching the vast tonnage of oxide copper ore blocked out in the Yerington region.

★More than 500 acres of placer properties in the French Corral and north San Juan areas have been purchased by **Minona Mining Co.** of Minnesota from G. M. Standifer, San Francisco, for about $50,000. Properties include the Esperance hydraulic mine, Milton and Shady Creek ditches, Pine Grove reservoirs at French Corral, and diversion dams. Minona has operated a dragline dredger at the Esperance mine for a year, handling 2,000 cu. yd. of gravel daily, and expects to step up production to 4,000 cu. yd.

★**New Idria Mining and Chemical Co.** has received approval by DMEA of its application for government assistance in exploration for new ore zones at New Idria mine in San Benito County. New Idria mine, largest domestic quicksilver producer in World War I and II, was reopened about a year ago after a brief shutdown due to the low metal price. President Gordon I. Gould says nearly 6000 ft. of underground workings will be driven to explore geologically favorable virgin areas in the mine. The $243,349 project will take two years to complete.

COLORADO

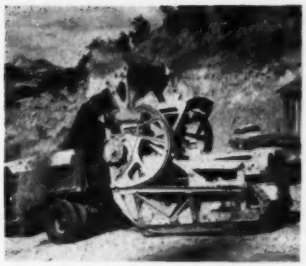
★**Chain O'Mines** announces that the Glory Hole mine near Central City in Gilpin County, will start up soon. Glory Hole, known as The Patch, comprises 15 acres. The pipe line is being repaired to the mill, and the goal at present is to treat around 2000 tons of ore daily.

★**Silver Bell Mines Co.** at Ophir has built, and now has in operation, a complete new tungsten milling plant. Tungsten ore occurs at wolframite in stopes in the Silver Bell mine. Exploration development is going on in three places on the Panama and Carbonero veins. The Carbonero mine is showing up well; a third compressor is being installed, also new tram cars and a new mine car loader.

★**Red Elephant Metals, Inc.**, owner of a group of mines in the Downieville mining district, has leased the Comstock Lode to the Windy Point Mining Co. It was abandoned in 1893 when the silver price dropped to around 20c an oz., and lead to around 2c a lb. This Comstock vein varies in width from 3½ to 5 ft., values recorded as high as $264 per ton.

★The **Chatauqua mine** at Montezuma is being operated by Vinson and Harris. The ore is hauled to the Teller Basin Mining & Milling Co. mill and concentrated for shipment to the Leadville smelter.

★A rich stope of ore appears in the making on the 3100-foot level of the Ajax mine at Cripple Creek, according to C. H. Carlton, mine manager for the **Golden Cycle Corp.** Grab samples from the streak in the 4-ft.



REYNOLDS MINING CORP. is opening up a fluorspar mine near Poncha Springs, Colo. Unit shown in action here is an Eimco loader mounted on a Caterpillar diesel tractor.

wide Bobtail vein have been running between 4 and 5 oz. gold. Muck pile grabs have been going between $10.50 and $14 gold per ton. The first set of lessees has gone to work on the No. 24 level. The company has supplied an air tram to speed operations.

★Three more gold bars have been sent to the U.S. mint in Denver from the **Golden Cycle's Carlton mill** at Cripple Creek. The value of them was $78,500. Fifty-six bricks have been poured since the reduction plant was dedicated March 12, 1951. In June 13,721 tons were processed, or about 700 tons more than during May. The daily average is about 600 tons.

★**Acme Mining Co.**, of San Francisco, Calif., has completed repair work on the Carbonate Queen mine in Eclipse Gulch at Cripple Creek, according to W. A. Hayes, president and manager. A power line has been completed from the Ajax mine to the Eclipse shaft, and a drift started east on the No. 2 level to cut cross veins has now reached a distance of 132 ft.

★**The Owl Tunnel** on Gibson Hill near Breckenridge is to be reopened. The tunnel was started to cut at depth the veins of Gibson Hill and particularly the veins on the Detroit, where many thousands of dollars of lead ore have been mined. After the tunnel is cleaned out, plans will be laid for its completion to cut the known veins of Gibson Hill.

★The road to **Camp Bird mine** near Ouray has been greatly improved with surfacing and grading.

★To assist in the search for uranium bearing orebodies, the U.S. **Atomic Energy Commission** will publicly release information concerning location of surface areas of unusual radioactivity that have been disclosed by aircraft-borne detection instruments.

★**Joe and Sam Fellin** have taken a lease on the **Mickey Breen-Monarch** properties near Ouray from the Liebhardt Estate. They started work in June and have just made their first shipment.

★**Merrill E. Shoup**, president of the

EIMCO

Drum Type

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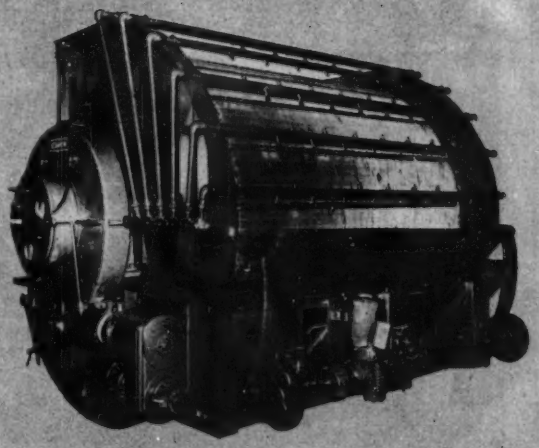

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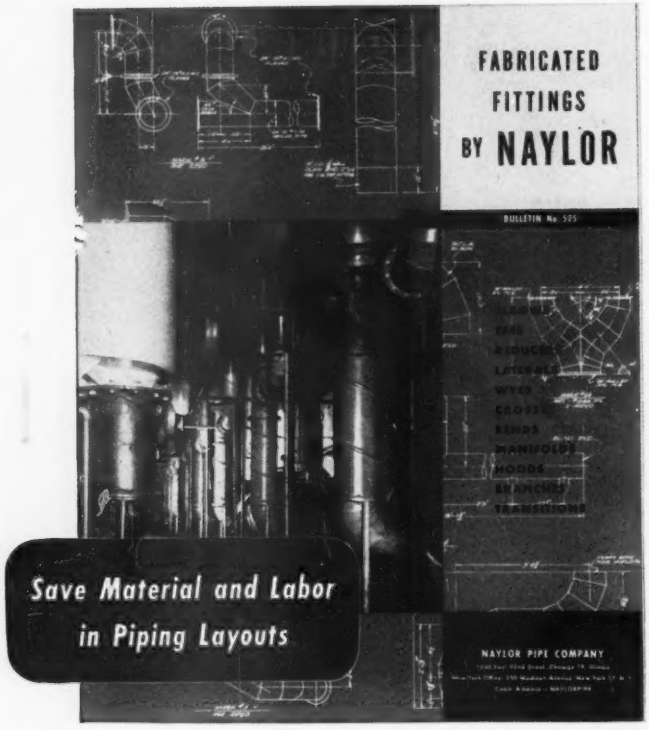

Write for this helpful bulletin on Naylor Fabrication Service. It presents data on standard and special fittings for lightweight pipe and offers practical ideas to simplify piping layouts. Included are special fabrications to save time, material and labor through eliminating numerous flanged joints and combining many fittings into one integral unit. Ask for Bulletin No. 525.

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Colorado (*Continued*)

Golden Cycle Corp., says Colorado's gold mining interests are watching the progress of a forthcoming lawsuit against the government to recover damages suffered during a 30-month shutdown of the gold mining industry in World War II. Mr. Shoup said that eventually he expects Colorado's gold mine owners to file for damages, but they would probably wait until they see how the initial suit against the government progresses.

IDAHO

★**Hecla Mining Co.** has expanded its extensive holdings in the Mullan area of the Coeur d'Alene mining district by acquisition of the Cee Gee and Glenclif groups, each of which comprises 10 claims. Both groups were obtained from C. H. Hunter of Coeur d'Alene, the former under a lease and option agreement and the latter by outright purchase. They are in what is known as the "Atlas participation" area, a vast area of more than 10 mi. in east-west length which has been consolidated under a series of agreements for development by Hecla, Newmont Mining Corp. and New Jersey Zinc Co. in conjunction with their deep shaft project on Atlas Mining Co. property.

★**Silver Star Mines, Inc.,** has resumed surface exploration work on its large block of mining ground just north of the Osburn fault north of Wallace in the Coeur d'Alene district. Current work is confined to bulldozer stripping and trenching of surface outcroppings.

★**Gibbonsville Mining & Exploration Co.** has been granted a $62,000 production loan by the Reconstruction Finance Corp. and has commenced work on a 400-ton flotation plant to recover lead, zinc, and silver values from a tailings deposit in the South Fork of the Coeur d'Alene River about 2 mi. west of Kellogg.

★**Sunshine Mining Co.** is deepening its No. 5 winze from the 3700 to the 4000-ft. level. Plans call for establishing two new working levels from which to open and develop the downward extension of the big Sunshine silver vein, one at the 3850-ft. horizon and one at the 4000, approximately 1300 ft. below sea level. The shaft work will establish a new depth record for mines in the Coeur d'Alene mining district.

★**Jack Etherton and Walter Schmittroth,** leasers at the Big It Mining and Milling Co.'s tungsten property on Trapper Creek in the Pine Creek area of the Coeur d'Alene district, have been granted an $18,000 DMEA loan to finance further exploration of the tungsten vein from which they have been making shipments for the past year. The leasers have been working a narrow shoot of ore about 50 to 60 ft. long and it is believed

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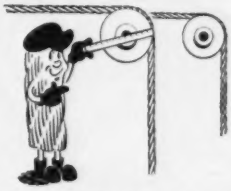

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Keep Lines from Rubbing

Keep Drums and Sheaves Aligned

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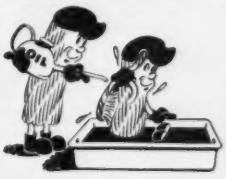
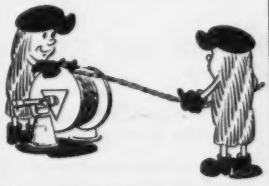


Lubricate Your Lines Regularly



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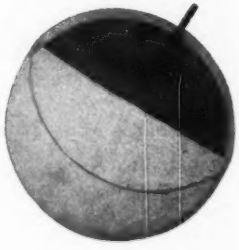

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Idaho *(Continued)*

that additional exploration work may disclose other ore shoots along the vein structure.

★**Sullivan Mining Co.** has started preliminary work on a sulphuric acid unit at its electrolytic zinc plant west of Kellogg. Contracts for the new facility, which will recover sulphur in the exhaust gases from the zinc-roasting process, have already been signed. Plans are said to provide for an app oximate daily output of 250 tons of sulphuric acid.

★The new orebody which **Nabob Silver-Lead Co.** discovered last March has been proved over a length of 400 ft. Development ore from the drift work, which was run about 8½x9 ft. in the clear, has averaged 7 to 10% combined lead and zinc over the entire length of the main part of the structure. Additional short lengths of marginal ore have been opened on both ends of the main ore shoot.

★American Smelting and Refining Co. has three development headings in progress at its **Vulcan-Galena deep development** project on Lake Gulch west of Wallace. Drifts are being run both to the east and to the west on one of the ore structures in the wide zone of mineralization first opened in 1950 in a south crosscut from the bottom of the 3000-ft. Vulcan shaft. The third development heading is a raise. Production from the work is being milled by Zanetti brothers at their Galena mill, which is located a few hundred feet down the gulch from the shaft. Approximately 800 tons of ore were milled during June. Mill heads averaged about 7% lead and 7 oz. silver per ton.

★Idaho Titanium and Mining Co. of Weiser, plans to construct a $150,000 titanium plant in the Weiser area if test work now under way in Salt Lake City proves satisfactory. The area around Weiser reputedly contains large quantities of ilmenite.

KENTUCKY-ILLINOIS

★Properties of the **Crystal Fluorspar Co.**, which began operation in the Illinois fluorspar mining district in 1930, have been sold to Minerva Oil Co. Two producing mines, the Crystal, located in the Cave-in-Rock section of Hardin County, and the Jefferson, lying in the western section of the county 6 m. from Elizabethtown, as well as all milling and plant equipment, were included in the transfer. A Heavy Media Separation plant was installed at the Crystal mine three years ago. Operations were suspended June 1, pending sale negotiations. Crystal company has been one of the major producers of metallurgical grade fluorspar since operation started 22 years ago with properties under the management of Miles Haman and D. G. Gibson.

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another WKE job in progress!

This new 1000 ton lead-zinc selective flotation concentrator, located near Northport, Washington, is another contribution to the industrial strength of America. It was designed and is being built by WKE for one of the nation's major mining companies, and is scheduled for completion in the fall of 1952.

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OTHER WKE PROJECTS IN PROGRESS

1. **Coons-Pacific Company,** Minnesota, recently placed this 300TPH iron ore concentrating plant in operation. WKE participated in the design of this plant. It includes a heavy-media Mobil-Mill, a jig concentrating unit, and a spiral unit.

2. **Triumph Mining Company,** Hailey, Idaho recently placed this 200 TPD lead-zinc selective flotation plant in operation. It was designed and built by WKE.

3. **Basic Refractories, Inc.** at Gabbs, Nevada, is operating a 50 TPH heavy media Mobil-Mill for processing brucite; — plant designed and built by WKE.

4. **Del Monte Properties Co.,** Pacific Grove, California, is utilizing WKE design and engineering service for construction of a unique 50 TPH sand attritioning and selective flotation plant.

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STORAGE BATTERIES

Kentucky-Illinois *(Continued)*

Minerva Oil Co., which entered the fluorspar field in 1944, a major producer of ceramic grade fluorspar and zinc, tentatively plans to begin operation of its newly acquired properties in September.

MICHIGAN

★**Michigan iron ore reserves** in its four iron mining counties—Dickinson, Gogebic, Iron and Marquette—are up slightly over 1951, an increase of 295,020 tons to 162,221,921 tons. Marquette County, though showing a loss of over 3-million tons for the year, still has 2,737,004 tons more than Iron County, which increased from 59,578,187 tons to 62,381,686 tons. Dickinson County remains unchanged with 558,540 tons, mostly silicious ore. All four counties received a boost in valuation, with the total valuation raised $10,144,000 to $79,010,000.

★**Work is going on at four Iron County iron mines** which are in the development stage and, therefore, not involved in the strike. They are the Cannon mine, east of Stambaugh, of the M. A. Hanna Co.; the Cayia mine, east of Crystal Falls, of Inland Steel; the Carpenter and the new Fortune Lake open pit development, both Pickands, Mather & Co. properties.

★Peter Kiewit & Son of Omaha, Neb., has been awarded the contract for stripping the Fortune Lake open pit mine for **Pickands, Mather & Co.** The pit is on the site of the old Bristol property, which had a brief existence 30 years ago. The contractor has begun to move heavy-duty earth-moving equipment to the mine. The contract also calls for the installation of about 2 mi. of railroad track, including a relocation of the main Milwaukee road line between Crystal Falls and Iron River. The area to be stripped now is about a quarter of a mile long and 400 ft. wide. After the open pit ore has been exhausted, the remainder of the orebody will be mined by the underground method.

★Harold J. Richards, general superintendent for Pickands, Mather & Co. on the Menominee Range, has announced the letting of a contract requiring the construction of 2 mi. of railroad track facilities along an old grade at the Lawrence mine. The company has been rehabilitating the old Carpenter shaft to serve the Lawrence.

★A drill hole, said to be the deepest ever drilled in this country in search of iron ore, was completed at 5,600 ft. on May 19, by the **Cleveland-Cliffs Iron Co.** Hole No. 43 is west of Ishpeming and was started Nov. 28, 1950. Seven C.C.I. Co. employees worked on an around-the-clock basis to set this new record in iron ore exploration drilling.

★The Proksch Construction Co. of Iron River has been awarded the con-

CF&I

STEEL PRODUCTS FOR THE MINING INDUSTRY

FORGED STEEL GRINDING BALLS

- Highly impact-resistant
- Remain spherical
- Wear evenly
- Forged from special analysis steel
- Designed for efficient, economical grinding

CF&I Products for the Mining Industry

Cal-Wic Wire Cloth Screens • Mine Rails and Accessories
Rock Bolts • Wickwire Rope • Grinding Balls
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THE CALIFORNIA WIRE CLOTH CORPORATION, OAKLAND
THE COLORADO FUEL AND IRON CORPORATION, DENVER and NEW YORK

CF&I FORGED STEEL GRINDING BALLS
THE COLORADO FUEL AND IRON CORPORATION

1120

Making History on the Mesabi

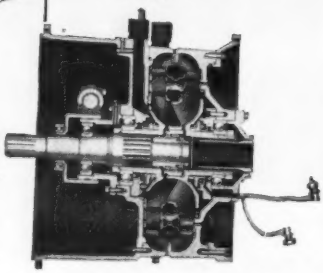
with TWIN DISC'S exclusive braking feature Torque Converters...

Twin Disc's *three-stage* Hydraulic Torque Converters, proved superior for heaviest off-highway haulage, are making history on the Mesabi and in similar hauling in the mining, construction and logging industries.

The exclusive feature of Twin Disc *Truck Type* Torque Converters is a down-hill braking action. Mesabi range drivers find that even on the toughest grades, the vehicle can be kept at a reasonable speed by the *converter braking action* without the use of brakes. Down-hill, converter combines with engine to perform 90% of the braking.

Up-grade, Twin Disc converters provide highest torque multiplication; automatically match engine power to load and grade through an infinite number of ratios to keep the engine *always* working in the efficiency range.

But most important of all, Twin Disc Torque Converters prevent shock loading of drive line and engine—*all the time*. Differentials, drive axles and final drives now stand up for more than 10,000 actual working hours . . . or twice former normal expectancy. Tires last much longer. Engine life, too, has been extended for these same reasons.



Twin Disc Torque Converters for trucks provide highest torque multiplication—practically eliminate uphill gear shifting—help perform most of braking. Model DF has selective braking and direct drive for longer hauls; Model CF provides automatic braking with constant torque converter drive . . . best suited to short, steep hauls.

Like all Twin Disc Hydraulic and Friction Drives, Twin Disc Truck Type Hydraulic Torque Converters are "built for a long life—backed for a lifetime". Complete stocks of service parts and complete replacement units are carried at Twin Disc's 8 Factory Branches and 60 Parts Stations, strategically located to provide quick service.

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

BRANCHES: CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEWARK • NEW ORLEANS • SEATTLE • TULSA

Michigan *(Continued)*

tract for the main surface plant building at the **Jones & Laughlin Ore Co.'s** new Tracy mine at Negaunee. The contract is reported to be for $1,400,000 with the completion date set for Dec., 1953. The L-shaped structure, of brick and steel construction with concrete foundations, will contain offices, machine shops, laboratories, boilerhouse, and dry.

MINNESOTA

★**Freeport Sulphur Co.** is conducting two diamond drill operations in Canada, exploring for pyrite. One is located not far from Steep Rock Lake and the other near Beadmore, Ont. Sherman Tough is engineer in charge of both operations.

★**The two iron ore carriers** being built in England for the Iron Ore Company of Canada are scheduled for delivery in 1955 and 1956. They are designed to carry over 30,000 tons each. The railroad from the mines to Seven Islands on the St. Lawrence River and dock facilities are expected to be ready in 1954.

★State Conservation commissioner, Chester S. Wilson, has authorized the **Pickands, Mather Co.** to use 3,000 gpm of water from Prairie Lake for its West Hill mine washing plant near the Prairie River. The order is for April, May and June, 1953.

★Among the protests filed with the St. Louis County Board of Equalization was one by **Oglebay, Norton & Co.** in behalf of the Reserve Mining Co. as to assessments on dwelling and structures on two pieces of property in the town of Argo.

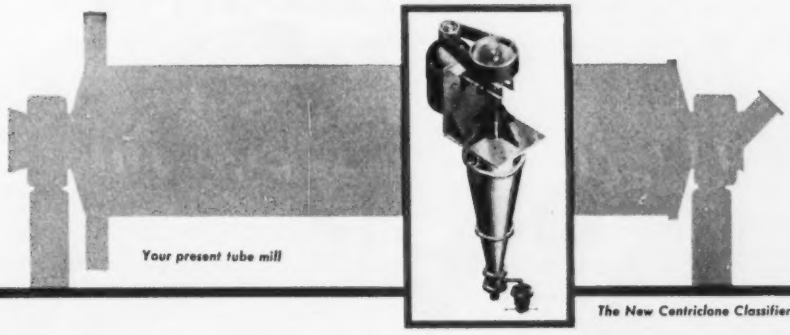
★The U. S. Bureau of Mines plans to build and equip a **Minnesota experiment station** at Fort Snelling for research to develop mining and processing of low-grade ores. Estimated cost is $1,335,000. Iron ore and taconite and low-grade manganese ores would be a major part of the project. Low-grade copper-nickel ore of northern Minnesota; copper from Wisconsin and Michigan; zinc-lead fom Wisconsin and Iowa; lignite of North Dakota; coal of Iowa; sulphur from iron sulphides in Iowa and Minnesota; titanium of Minnesota; and various pegmatite minerals of South Dakota would also receive attention.

★Donald B. Gillies, vice president of the **Lake Superior Iron Ore Association**, fears that the prolonged steel strike will result in another shutdown next spring because of an ore shortage then at the furnaces. The lake ore transportation season is passing rapidly and all-rail winter haulage is an ineffective substitute. Each day of idleness added about 200,000 tons to next spring's potential shortage.

★When the ore boats which have been tied up by the steel strike have been loaded and ore movement is back to

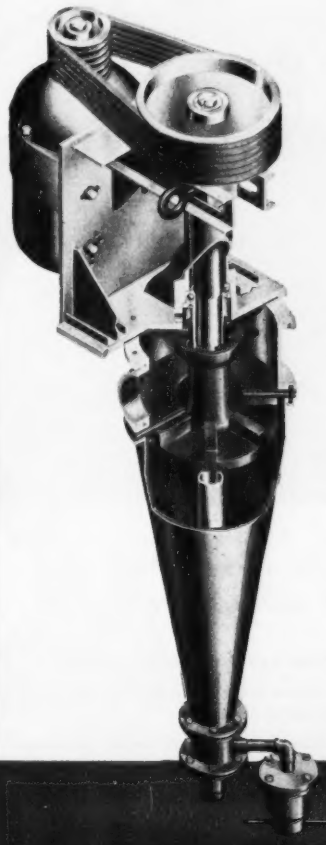
CLASSIFICATION WITHOUT DILUTION

Producing a −65 mesh grind at 65% solids



Your present tube mill

The New Centriclone Classifier



And a −100 mesh classifier overflow can frequently be produced at 60% solids. Centriclone classification is a new technique that maintains high density in the classifier overflow. It is utilized in fine grinding where open circuit tube mills are being used. This is a new application of the Centriclone Classifier which is primarily being used on sub-sieve sizings of more dilute slurries, usually in the 20 micron range.

COMPARATIVE DATA IN A CEMENT PLANT APPLICATION

In this limestone grinding operation, each 7′ x 26′ Allis Chalmers Mill is in closed circuit with a Model C-20 Centriclone. They were previously in normal open circuit. Here is the comparative performance.

	Open Circuit	Closed Circuit with Centriclone
Production, tons per hour	21.4	31.5
Percent solids in product	63.0	64.5
Percent −200 mesh	88.0	88.0
Largest particles in product	*20 mesh	65 mesh
Total kwh. per ton	20.5	14.5

*After screening at 14 mesh

CENTRICLONE GIVES THESE IMPORTANT ADVANTAGES

1 **Low capital investment** — The Centriclone is a simple gravity fed installation of modest cost, yet it increases tube mill capacity 25 to 50 per cent as compared to open circuit operation.

2 **Reduced grinding costs** — Power and grinding media unit costs are substantially lowered because over-grinding of the fine sizes is greatly decreased.

3 **Elimination of tramp oversize** — Classification giving a thick overflow product is possible because of the complete control of centrifugal force and residence time that characterize the Centriclone Classifier.

EQUIPMENT ENGINEERS, INC.

For Greater Mine Safety

M·S·A

MINEPHONE

COMMUNICATION

SYSTEM

With mechanization increasing production, your haulage system must "keep ahead" to realize maximum tonnage. The M.S.A. MinePhone helps fill this need by providing a modern underground system that maintains continuous trip movements throughout the mine.

The M.S.A. MinePhone brings greater underground safety, too. Track conditions, derailments, or roof falls can be reported immediately. Time-consuming calls to each individual are eliminated—a big advantage in emergencies. You'll find complete details on this modern, two-way voice communication system in our booth.

Let us show you how the M·S·A· Minephone can—

- ★ **Minimize chances of error and accidents.**
- ★ **Coordinate trip traffic for safer, more productive haulage control.**
- ★ **Prevent excessive stop-start strain on haulage equipment.**
- ★ **Maintain control of empties for peak loading efficiency.**
- ★ **Eliminate trip delays.**
- ★ **Reduce frequency of motormen getting on and off trips—saves time—avoids injury.**

Increased TONNAGE

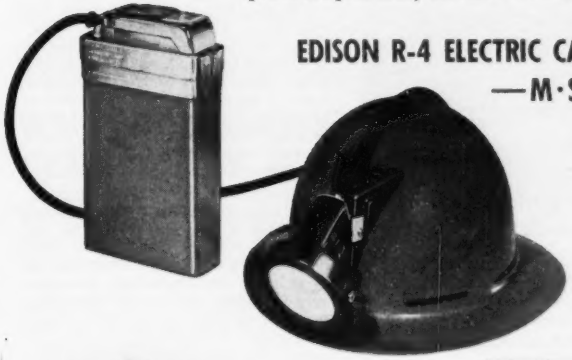
get First-hand Facts on this

M·S·A EQUIPMENT

BOOTH NO. 608—METAL MINING SHOW

Helping your efforts to step up mine production and boost overall mine safety is our job here at M.S.A. You'll see these products, plus many more, at our Booth No. 608—Metal Mining Show. You are cordially invited to come in and visit.

We'll be looking for you.



EDISON R-4 ELECTRIC CAP LAMP —M·S·A TYPE K SKULLGARD

This popular combination is helping miners bring into play every production advantage of mechanization. The Edison R-4 Lamp is designed to fill your needs for brilliant, unfailing light. Its construction keeps it on the job shift-after-shift, for years. The impact, moisture and oil resistance of the Type K Skullgard has been proved in underground operations everywhere. Let us show you how this production-safety team can benefit your operation.

M·S·A SELF-RESCUER

For immediate breathing protection in emergencies caused by fire or explosion, M.S.A. developed the Self-Rescuer. This Bureau of Mines approved safety item provides the precious minutes of emergency breathing protection so vital to the miner while traveling through carbon monoxide to fresh air.

M·S·A PNEOLATOR

This compact, portable unit assures maximum chance of recovery to miners overcome by poisonous gases or asphyxiated from any other causes. Automatically provides oxygen for the lungs at the pre-selected amount and pressure, continuously, effectively, safely. Normal passive return of respiratory muscles produces exhalation.

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SAFETY EQUIPMENT HEADQUARTERS

When you have a safety problem, M.S.A. is at your service. Our job is to help you.

Dig Everything from Mud to Rock

with

STOCKTON "YUBABILT" CLAMSHELL BUCKETS

Stockton "Yubabilt" Power-Arm type clamshell bucket, 6 cu. yds., 22,000 lbs., welded steel plate construction, round nose without teeth, custom-built for Hawaiian Dredging Co.

2 TYPES—California and Power-Arm
CAPACITIES—½ to 6 cu. yd.
3 WEIGHT CLASSES—Heavy; Standard; Special Light Weight
WEIGHT RANGE—2125 lbs. to 45,000 lbs.

California Type designed expressly for channel and reclamation dredging, has few working parts, well balanced for digging peat soil, river bottom adobe and mud; discharges quickly and cleanly. First built in 1872, produced continuously ever since.

Power-Arm Type built for tough, continuous digging of rock, hardpan, coral and other hard, abrasive materials. Correctly balanced weight and powerful closing action provide exceptional digging ability. Especially suited to close-up work near wharves and on caisson jobs.

Both the California and Power-Arm types are built in all three weight classes:

HEAVY for extra penetration in tough digging.

STANDARD for most dredging jobs.

SPECIAL LIGHT WEIGHT for soft, slushy materials.

Consult us about clamshell buckets. Estimates gladly furnished. Wire, write or call NOW.

YUBA specializes in the manufacture of
Bucket Ladder Dredges
Parts
Screens
Conveyors
Hoist Equipment

YUBA MANUFACTURING CO.
Room 706, 351 California St., San Francisco 4, Calif.
or
STOCKTON IRON WORKS
P. O. Box 1331 Stockton, California

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Minnesota *(Continued)*

normal, heavy all-rail ore shipments probably continuing throughout the winter are predicted. From 600 to 700 cars per day are expected in an effort to make up, as far as possible, the loss due to the eight-week steel strike.

MONTANA

★Active work is going on in two exploratory tunnels of the **Minerals Engineering Co.** at its Lost Creek tungsten property, 7 mi. west of the Union Pacific Railroad at Glen, Beaverhead County, south of Butte. A total of 3,000 ft. of tunneling is planned to explore the downward extension of large surface outcrops of tungsten ore having widths from 27 to 45 ft. and lengths varying from 600 to 1,100 ft. The orebodies are reported to carry substantial amounts of molybdenum as well as tungsten. The tunnel work is being financed by a government loan, but Minerals Engineering Co. is doing diamond drilling below the tunnel levels. If ore developments warrant, it is planned to build a mill in that district. Blair Burwell, Grand Junction, Colo., is president of the Minerals Engineering Co. and mine development is being carried on under M. N. Shaw, general superintendent of operations, and James Tiernahan, engineer.

★About 3 mi. north of the Lost Creek mine, **American Alloy Metals, Inc.**, has completed a crosscut tunnel to the tungsten orebody on its Ivanhoe claim near Brown's Lake. A development raise in the ore is preparing the property for mining a deposit, which diamond drilling has indicated to be approximately 50 ft. thick.

★**Blue Dot Mining Co.** of Dillon was incorporated July 9, with capital of $50,000. Directors are Oscar Argerbright, Mary Dorothy Argerbright, both of Dillon, and Elizabeth T. Bluechel of Missoula.

★Sixty members of the Bureau of Land Management of the Department of the Interior, headed by Marion Clawson, Washington, D. C., director, and five congressmen inspected plants of the Anaconda Copper Mining Co. at Butte and Anaconda following a three-day business meeting at Billings.

★**Esther May Corp.**, a mining company of Troy, Lincoln County, was incorporated July 17, with capital of $50,000 by Lubin and Mary Loveland, and B. V. Lower, all of Eureka.

NEVADA

★Eight men are currently at work on the lead-zinc property of the **Fowler Mining Co.** in Esmeralda County, very near the California state line. A treatment plant has been erected on the property capable of handling 50 tons of concentrates daily. Earl S. Fowler is in charge, and concentrates are be-

NEW Cedarapids Schrock Motorized HEAD PULLEYS

Built by IOWA

SIMPLIFY EVERY BELT CONVEYOR AND BELT-BUCKET ELEVATOR INSTALLATION

IT'S COMPLETELY DIFFERENT FROM CONVENTIONAL CONVEYOR DRIVES

Everything is contained **INSIDE** the pulley!

ELIMINATES ALL MAINTENANCE ON SPROCKETS, CHAINS, JACK-SHAFTS, V-BELTS, ETC.

U.S. Pat. No. 3548399 Others Pending

WHAT A *Motorized* HEAD PULLEY IS

THIS is a revolutionary departure from the conventional types of conveyor drives. A *motorized* head pulley is a fabricated steel pulley with *everything*... electric motor, reduction gears and all moving parts . . . contained inside the drum! It's simply a new application of the long-proven gear reduction drive, and because of its simplicity, it's the answer to the maintenance man's prayer. 70% to 90% of conveyor down time is saved by eliminating all countershafts, speed reducers, sprockets, chains, Universal shaft drive and other parts necessary with conventional pulley drives. Motorized Head Pulleys are simple to install and flexible in use, completely interchangeable and adaptable to all types of belt and belt-bucket conveyor installations. By means of a simple adapter, a single pulley can be utilized in any of several belt locations, operating various widths of belt, or changing from larger or smaller horsepower. Pulley sizes range from 5 to 30 HP and are available in various widths. A Motorized Head Pulley is safe, because there are no sprockets, chains, jack-shafts, V-belts, etc. to endanger personnel. It's compact... requires no more room than a conventional pulley. Complete protection from weather, grit and dirt also reduces maintenance. Cedarapids Schrock Motorized Head Pulleys have been job-tested for many years under severest working conditions.

HOW IT WORKS

The pulley shell rotates about the electric motor, which is held stationary by means of a torque arm attached to the conveyor frame. The speed of the shell depends upon the combined reduction ratio of the various pinions and gears contained within the pulley shell. This reduction starts with a primary pinion mounted on the motor shaft and ends in the ring gear attached to the shell. The shell in turn then drives the conveyor belt. Leads to the motor enter the head pulley through a hollow conduit passing through the drum end bell and bearing. A simple oil bath gear compartment provides a lubricating bath for the reduction gears and front motor bearing. Motor and head pulley are cooled and ventilated by holes in the drum.

GET COMPLETE DETAILS TODAY

Find out all the advantages of converting your conveyor installations to motorized efficiency before you need head pulley replacements. One internationally known company has 50 Motorized Head Pulleys installed on widespread conveyor operations, and plans more for every installation that requires replacement. Get complete details about every feature. See your distributor today, or write direct to Iowa Manufacturing Company.

IOWA MANUFACTURING CO.
Cedar Rapids, Iowa, U.S.A.

Western Sales:
YUBA MANUFACTURING CO.
351 California St., San Francisco 4, Calif.

Nevada *(Continued)*

ing shipped to the Lippincott smelter in Bonnie Claire.

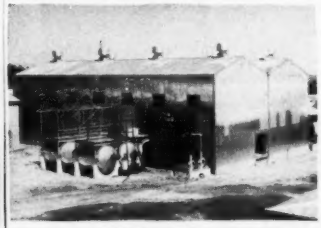
★More than **100 tons of sulphur** have been uncovered in preliminary operations by Oscar Streeter and Pete Peterson, of Elko, who are developing what promises to be an important sulphur deposit near Beowawe.

★New bunk houses and other structures are being completed at the **Mohawk mines property** at Argentite where 20 men are now employed producing silver ore. Bruhi Enterprises are in charge of the operations, and a tunnel driven 200 ft. into the orebody shows excellent prospects.

★**The Rip Van Winkle mine** in Elko County has reopened and is again producing lead-zinc ore. The mine is under control of the United Minerals Corp., and work is proceeding under the direction of Don Hyde, formerly with the Bristol Silver Mines in Pioche. George W. Snyder, general manager says the present plans are to deepen the existing winze an additional 200 ft. and to conduct considerable drifting from the bottom of the winze after completion.

★**Homestake Mining Co.**, which has been carrying on an extensive drilling program in the Tonopah area, reports drill cores at the Summit King mine show "typical Tonopah quartz." The cores are reported. Assay reports are not being made public. A crew of seven men, including the drillers, is now at work on the exploration program. The holes are being struck off from the face of the drift inclining downward at between 45 and 55 deg.

★**Copper Canyon Mining Co.**, is producing an average of 300 tons of gold-silver, copper and lead-zinc ore at its property near Battle Mountain. Robert Raring is general manager, and 48 men are employed on the property. The mine was originally a gold producer, but the orebody turned into copper down to the 500-ft. level; Below that is lead-zinc ore.



NEWLY COMPLETED USBM titanium research building in Boulder City, Nev.

★The recent drop in lead and zinc prices may seriously affect the operations of mining activity in the Pioche area. Sam A. Arentz and Paul Gemmill, engineers for **Combined Metals Reduction Co.**, said their company is threatened with a serious price loss and might have to mine some of its high-grade reserves.

★**Lead King Mines** is planning early construction of a lead concentration plant at its property 16 mi. north of Las Vegas. Developments include a 200-ft. shaft, drifts and tunnels.

★The Nevada Atomic Power Utilization Committee is awaiting favorable action from the Atomic Energy Commission on the committee's report for feasibility of establishing the world's first commercial atomic power plant. Proposed site is at the **Richmond Eureka mine** of Eureka Corp., Ltd., 2½ mi. from Eureka, where absence of cheap industrial power has halted operations in mining an estimated $175-million worth of gold, silver, lead and zinc ores.

Committee Chairman Alfred Merrit Smith has forwarded the feasibility report to Marion Boyer, general manager of the AEC, for consideration following a request for such information from Dr. Lawrence R. Hafstad, director of reactor development for the AEC, at a July meeting in Reno, attended by members of the committee and Senator George Malone, Republican, Nevada.

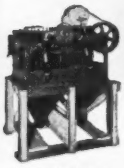
At present Eureka is paying 3¢ per kwh for diesel power. While the firm

Denver-Dillon Vibrating Screens

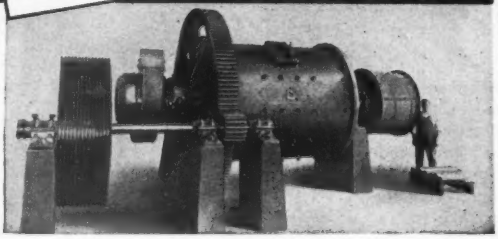
Denver Ore Feeders

Denver Jaw Crushers

Denver Disc Filters


Denver Selective Mineral Jigs

DENVER the Ball Mill with STEEL HEADS



Denver SRL Pumps

What happens when a Ball Mill head breaks?
Mill men know that replacement cost
is small *compared to losses caused by mill shutdown!*

Denver-Buckman Concentrators

Steel heads on DENVER BALL MILLS put *strength* where it is needed. Repeat orders from mills all over the world prove dependability of Denver Steel Head Ball Mills. A Denver Steel Head has never failed!

SIZES: Diameters of 12" - 16" - 24" - 30" - 36" - 48" - 60" and 72" in lengths up to 12 feet.

Please write to us about your requirements. Quantity production of standard DECO equipment means lower cost and good deliveries.

Complete mill equipment from testing...to feeder...to dryer.

DENVER "SUB-A" FLOTATION
—for 25 years the greatest name in Flotation Engineering.

Denver Mechanical Gold Pan

We can give you good deliveries

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"The firm that makes its friends happier, healthier, and wealthier"
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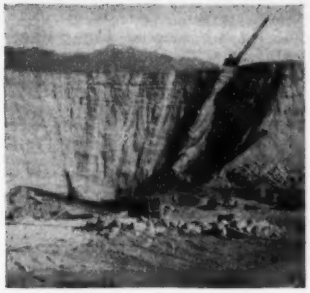


ROUND MOUNTAIN dredging operations in Nevada dig into 185-ft. gravel bank with shovel and dragline to recover gold values in washing plant. The gravel-mining work is now being handled by Morrison-Knudsen.

hasn't announced what it would be willing to pay for atomic power, it feels that such power could be furnished for less than the 3¢ figure; at the same time, it would give the AEC a rate in excess of what could be paid by large commercial firms in populous centers where industrial power is cheaper.

★**Key West Nickel and Copper Corp.**, with offices in Las Vegas, N. M., has taken over the operation of the old Key West mine at Bunkerville, Clark County. A new leaching plant is now being started to treat the oxidized copper and nickel ores here totaling several thousand tons. Platinum will be removed by gravity concentration. Later a flotation plant will be installed to treat sulphide ores from underground operations. The property was discovered about 50 years ago, and latest previous operations took place about 25 years ago. Ore values run from 3 to 9% copper, 2 to 4% nickel, and from 0.25 to 0.50 oz. platinum.

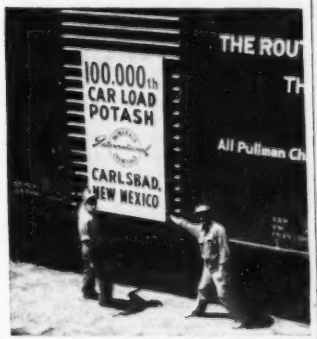
★Rex R. Lloyd, chief of the Electrometallurgical Branch, Metallurgical Division, Bureau of Mines, Region III announces that a new development section of the **titanium research program of the Bureau** has started up at Boulder City. The new section, headed by M. G. Mastin, will operate a large-scale production and demonstration plant to supplement the laboratory and smaller-scale work of the titanium research section.

Plant equipment (see illustration) includes storage and purification plant for titanium tetrachloride, a group of conventional batch reactors with accessory equipment for producing, purifying, and handling crude titanium sponge metal, and space for experimental reactors.

This plant will employ the Kroll process, the only commercial one for producing material that can be processed to massive, ductile metal. The metal produced will go elsewhere for further testing, fabrication, and application.

NEW MEXICO

★**Suwanee Gypsum Products Co.** has started production from its mine at Suwanee, 30 mi. west of Albuquerque. Partners in the enterprise are John Scott, of Santa Fe, and John Kime, of Chilili. The gypsum is said to be



INTERNATIONAL MINERAL & Chemical Co. has shipped its 100,000th carload of potash from the mines at Carlsbad.

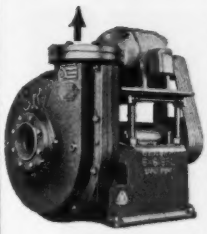
Denver "Sub-A" Flotation

Denver Cross-Flow Classifiers

Denver Hydroclassifiers

Denver Super-Agitator and Conditioners

Lower Cost Pumping IS possible with DENVER SRL... Rubber Lined Pump



Examples of DENVER SRL Rubber Lined Pump Curves*

Here's Why...

Power cost is 30% to 70% *less* than for other sand pumps on similar service. *REASON:* greater hydraulic efficiency resulting from simple design, rubber parts and lighter weight. Accuracy of rubber parts results in 1½ to 3 times greater efficiency than other sand pumps.

Learn More About Actual Savings

If you pump –⅛" abrasives, describe your pumping requirements. Let us study and report specific advantages of Denver SRL Pumps over pumps you now use. Write Today!

Size	Gals. of water per minute		20' head	40' head	60' head	80' head	100' head
2"x2" SRL	50	RPM	838	1090	1320	1525	
		HP	.60	1.5	2.8	3.2	
3"x3" SRL	100	RPM	760	1053	1303	1453	
		HP	1.1	1.9	3.4	4.3	
5"x5" SRL	300	RPM	590	800	956	1087	
		HP	2.4	5.4	8.3	11.5	
6"x6" SRL	1000	RPM		862	1005	1122	
		HP		14.4	22.6	30.0	
3"x3" SRL-C	150	RPM	870	1145	1385	1580	1745
		HP	1.5	3.2	5.3	7.2	9.6
5"x4" SRL-C	350	RPM	655	850	1020	1160	1280
		HP	2.9	5.4	8.3	11.4	14.5
8"x6" SRL-C	800	RPM	500	655	780	890	980
		HP	5.7	11.6	16.8	22.3	28.6
10"x8" SRL-C	2000	RPM	485	610	710	800	855
		HP	14.0	27.8	41.2	56.3	71.6

(*Multiply these horsepower ratings by the specific gravity of your pulp to determine actual break horsepower required.)

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New Mexico *(Continued)*

valuable in combating excessively alkaline soils, such as border the Rio Grande in Mexico.

★Work is expected to start soon at **Lindsey Light & Chemical Co.'s** mill in the Corona district, erected last year to process bastnasite ore, found in connection with fluorspar there. The mine and mill have been closed during most of this year, though some tonnage was produced last year under management of W. M. Heim, member of a partnership which sold out to the Chicago corporation.

NORTH CAROLINA

★**United Feldspar and Minerals Corp.** will not rebuild its plant at Spruce Pine, which was destroyed by fire several months ago with a loss of $100,000. The company will continue operations of the pyrophyllite mines and plants at Staley, Glendon, and Stem.

★**Ruby mica producers** in the Franklin area want the federal government to establish a branch buying center in Franklin to eliminate the present 150-mi. haul of ore to the Spruce Pine depot established by General Services Administration, The Franklin-Sylva area consists of a belt approximately 35 mi. wide, extending from the edge of Haywood County to an area about 20 mi. west of Franklin. Defense Minerals loans have already been made on 13 mines in the district. Two of these have produced mica. These are the Cabe mine west of Franklin, and the Mary mine owned by the Pitt Mica Corp., 14 mi. west of Franklin.

★The Federal Government **mica-buying program** started up on July 22 at Spruce Pine. Approximately $12,000 was paid for 750 to 800 lb. of mica of various sizes. Present purchases are limited to 800 lb. per day. The contract for processing mica purchased has been let to L. M. Carpenter and Associates, of Spruce Pine.

★**John H. Hennessee** of Saluda, N. C., has leased a 30-acre tract in the Little Mountain area, Catawba County, which he plans to mine for graphite.

★**Carolina Vermiculite Co.**, Travelers Rest, S. C., a subsidiary of the Zonolite Co., will open a processing and distribution plant at High Point.

★**Carolina Pyrophyllite Co.**, as operators of Major Pyrophyllite Co., of Stem, began drilling Aug. 18 on a 14-acre tract on Bowling Mountain at Stem.

OREGON

★Paul Wise of Boise, Idaho, who is working the **Sheep Mountain manganese mine** in eastern Oregon, shipped a car of ore to Ray-O-Vac Co. at Salem early in July. Product of the ore is high-grade manganese oxide used in dry batteries.

★Approval of the Oregon Land Board for a **dredging project on Snake River** was reported in June by S. K. Atkinson, a mining engineer of Boise, Idaho. He had previously received approval of the Idaho Land Board. The project includes a 30 mi. stretch starting about 10 mi. north of Weiser, from which Mr. Atkinson said he expects to recover $171-million in gold, plus other metals including monazite. The project is in the area of the proposed Hells Canyon Dam, but the Oregon Board said any dams would be given prior right over Atkinson, with a time limit set on dredging.

★Ten tons of ore has been taken from the scheelite tungsten prospect on the Hall property near Ashland in Jackson County. An ore zone of 2½ ft. in width has been exposed. Milling will determine whether a worth while concentrate can be obtained.

★**The Shamrock copper-nickel mine**, about 30 mi. northwest of Medford in Jackson County, has been under investigation by the U. S. Bureau of Mines since the owners were unable to finance continued development work. The Bureau did 396 ft. of drifting, 3,419 ft. of diamond drilling, and 1,650 ft. of bulldozer trenching. The latter showed a separate surface deposit at least 200 ft. long, 200 ft. deep, and

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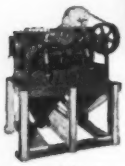
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Denver Mechanical Gold Pan

Sizes:

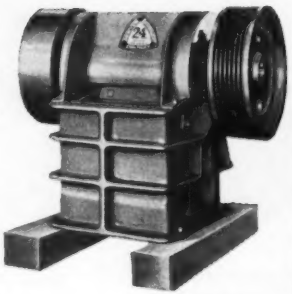
(Type "H"— anti-friction bumper bearings, bronze side bearings.)

2¼" x 3½"	8" x 10"
3¼" x 4½"	10" x 16"
5" x 6"	10" x 20"

Sizes:

(Type "J"— anti-friction bearing crusher.)

10" x 24"	18" x 36"
10" x 36"	21" x 36"
15" x 24"	21" x 40"
15" x 36"	25" x 40"
18" x 24"	32" x 40"



Specifications: Cast steel or fabricated steel frame. Cast steel bumper. 13%-14% Manganese steel jaws and cheek plates. Forced Feed crushing action. Safety toggle of cast iron protects against tramp iron.

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from 5 to 38 ft. wide. The mine deposit is at least 100 ft. long, 100 ft. deep and 1 to 25 ft. wide according to the report. Tests at Albany showed the ore is not amenable to concentration into separate nickel and copper products. Further tests are planned to find out whether the low-grade bulk sulphide concentrate from which 90% of the copper and nickel was recovered, could be treated further by leaching.

★**A discovery of tungsten** is reported about 1½ mi. southwest of Ashland. A small open cut on the Hall property exposes an ore zone with a maximum width of 2½ ft. Ore from the cut is being milled to determine if an acceptable grade of concentrate can be produced.

★Up to July 1 the **chrome stockpile** at Grants Pass had received shipments from 32 Oregon producers and 27 California producers. It is estimated that more than 100 producers will deliver ore to the stockpile during the year. The government's program which has been extended to cover a three-year period with a total purchase of 350,000 tons, has spurred miners into action.

★Tests on three small samples of ore presented to the U. S. Bureau of Mines laboratory at Albany, have shown **a high uranium content**, but A. H. Robertson, chief of technical service at the laboratory, says, "We are making no claims except on the basis of these three samples." Radiometric tests showed one sample to contain about 7.8% uranium by weight, the second 9.4%, and the third 20%.

UTAH

★**A broad new market for phosphate rock** from the Intermountain region is foreseen with announcement of plans for a $5-million phosphate fertilizer plant at Garfield, to operate in conjunction with the AS&R smelter's acid plant output.

There are indications uranium and vanadium may be by-products of the new operation. No name has yet been assigned the concern which will operate the new plant, but it is a joint venture of American Smelting and Refining Co., Stauffer Chemical Co., and Kennecott Copper Co. The latter enters the picture through its ownership, with AS&R, of the Garfield Chemical and Manufacturing Co.

E. McL. Tittmann of AS&R, announcing the project, reported 60,000 tons of concentrated phosphate fertilizers will be produced yearly by the wet or leach acid process. Sulphuric acid will be provided from the added 250 ton daily output Garfield Chemical expects in 1953 on completion of the "fourth unit" at the AS&R smelter. Completion of this unit, now being built by Leonard Construction Co., will bring Garfield output to a 700-ton daily level.

A 600-acre site adjacent to current smelter and acid plant operations at Garfield, Utah, has been set aside for the new project. Phosphate rock is to come from the Bear Lake region of Wyoming and Idaho, chiefly from Lief, Wyo. mines.

★Giving mining of low-grade uranium ore in the Marysvale district a more solid economic base, **Vitro Chemical Co.** is completing a $1.1-million expansion program at the company's Salt Lake City plant.

Utah Construction Co. is completing a $400,000 plant expansion at Vitro facilities, with most of the work centering around four large thickener towers, each 70 ft. high, and a filter house. The original plant structure was the war-built Kalunite facility for the handling of alumina.

With filter house expansion, construction of the thickener towers, and crushing department expansion, Vitro will be able to mill 300 tons of ore daily. However, George White, vice president, believes the regular operating mill rate will be slightly over 200 tons daily.

WASHINGTON

★**When Kaiser Aluminum & Chemical Corp.'s Mead reduction plant** put its eighth potline in production on June

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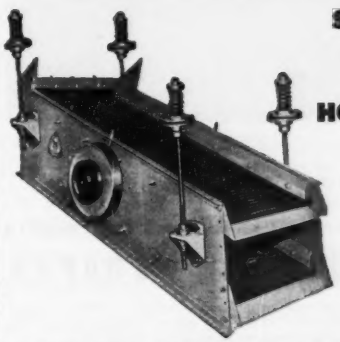

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Notice, on Denver-Dillon Vibrating Screens, that bearings are not anchored to heavy channel iron or other supports. Weight of screen and load is suspended. Bearings support only weight of flywheels and shaft. Screen is free of restrictions to impart maximum vibration to entire screen body.

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Washington *(Continued)*

30, it became the largest such plant in the nation. It is expected that Kaiser's approximately $12-million expansion program will be practically completed by the end of 1952. The first units of its $4-million fume control system were unveiled early in July and other improvements include a cryolite plant and a carbon plant. The new potline boosted the plant's total capacity to 350-million lb. annually. The fume control system consists of a network of hoods, to be placed over each of more than 1,100 pots, shielding equipment, pipes, and ductwork with exhaust fans. Eventually there will be more than 13 mi. of steel pipe and ductwork, ranging in size from 12 in. to 7 ft. Over 2,000 cu. ft. of air will be drawn from each pot a minute (two of the potlines have the system already installed). With the cryolite recovery plant, it is hoped that up to 50% of the plant's cryolite needs may be recovered. Before the end of the year it is expected that the new carbon baking furnace will be operating, supplying the plant's requirements of about 12,000 lb. of carbon monthly.

★Production at the **Lead Hill mine** in the Metaline district has been stopped because of zinc-lead price drops, according to Dale I. Hayes, western manager for American Zinc, Lead & Smelting Co. which started production at the mine late in 1951 trucking the ore to the Grandview mill. The company is also curtailing its exploration program across the Canadian border. Mr. Hayes said development work at the Lead Hill will continue with a small crew, but even that will be discontinued unless prices improve.

★**Grandview Mines**, which has obtained mineral rights to large land areas in the Northport district of Stevens County during the last two years, started drilling operations in mid July on a 160-acre tract between Anderson and Admiral Consolidated mines. Churn drilling was to be used first followed by diamond drilling on a contract basis. Stripping by bulldozer is proceeding in the area for exploratory purposes and road construction is under way.

★**Admiral Consolidated Mining Co.**, with property north of Leadpoint, has overhauled its mill for lead and zinc separation. It will custom-mill ore from Pacific Northwest Mining Co.'s Lucille mine until it is ready to resume milling from its own property. Norman D. Lindsley, mining engineer of Colville, is directing the diamond drilling.

★It appeared in July that four Washington gold mining companies **would sue the government** for at least $2,400,000 in damages as a result of the passage of the McCarran bill, which will permit gold mine owners to file claims for compensation regardless of statutes of limitations. Gold Bond Mining Co. with property near Blewett Pass and Gold Syndicate Co. with property near Orient were the two companies operating in the state when forced to close down by the WPB order. Frank Lilly, Spokane, president of these two companies said, "Filing of the suits will now wait until we have received copies of the bill." It was reported that Gold Bond would sue for $1½-million, while Gold Syndicate would ask $600,000. Gold Producers Corp. which was operating a mine near Shoup, Idaho, was reported to be ready to ask about $300,000, while Porter Bros., operating a dredge near Helena, Mont., when the WPB order came, is the fourth which is reported to plan to sue for an as yet undetermined amount.

★Roger N. Miller, mining engineer and metallurgist for the Border Lord Mining Corp., Seattle, has been assigned to prepare the **Apex-Wolframite** Mountain tungsten mines, near the Canadian border in western Okanogan County, for production. The deposits were discovered in 1904, and worked by German companies prior to World War I. It is reported that six carloads of wolframite concentrates were shipped to Germany.

★**U.S. Tin Corp.** is cooperating with the General Refining & Chemical Corp. of Seattle in conducting pilot plant experiments which may lead to con-

Picture shows a 400-ft span Sauerman Drag Scraper machine, powered by a 150 h.p. motor, backfilling an empty stope at a large nickel mine in Canada. Scraper cuts into side of hill and moves earth down to a raise at rate of 2,000 cu. yd. a day.

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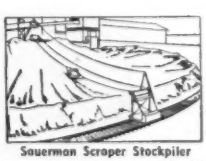

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The operator, sitting in a comfortable control station, easily guides the scraper over a large area. Automatic shifting of the tail end of the machine is provided where desired. Power requirement is moderate. Installation and upkeep costs are surprisingly low. Made in a wide range of sizes covering the capacity needs of large and small projects.

Write for Sauerman Catalogs A and E, showing how to use drag scrapers most effectively for pit excavation, stripping, pond cleaning, stockpiling, etc.

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SANTA CLAUS
Could Die of Old Age

No one shoots Santa Claus. This remark about a government which spends and spends and spends may well be true. But it is also true that Santa Claus is an old man. At his age overwork might well kill him.

It is with the possibility of working Santa Claus to death that this editorial is concerned. No position is taken as between the contending political parties in the present campaign. Our concern is with the problem of protecting Santa Claus.

It is true that as a nation we now enjoy great prosperity. The prosperity is not nearly so general as the political advertisements of it would suggest. Millions of individuals, notably those living on pensions, annuities and other fixed incomes, have been robbed of half their purchasing power by inflation during recent years, and whole industries know little or nothing of boom times.

However, measured by so basic a gauge as unemployment, we do have great prosperity. Less than two million of our total working force of over 64 million are unemployed, and many of them are unemployed only while moving from one job to another. The real income, i.e., what their dollars will buy, of those with jobs is somewhere near its all-time peak.

Our Prosperity is Precarious

The prosperity we enjoy, however, is precarious. This is primarily because it is dependent upon a rising volume of expenditures by the federal government. At present almost a quarter of our entire national income is ladled out through Washington, and in an ever increasing amount.

If, as matters now stand, federal expenditures were to be suddenly and sharply cut, our government-financed prosperity would be severely upset. But if the federal government were to try to keep right on providing prosperity by steadily increasing its expenditures, the end result would be more certainly disastrous. It would be a crash caused primarily by having continuing inflation of prices destroy the value of the dollar.

Higher government expenditures of worthless dollars then could accomplish nothing. Santa Claus would be dead from overwork.

To Provide Firm Foundations

The general route to be followed in putting firm foundations under our prosperity is quite clear. It involves two steps which must be taken closely together. The first is to stop the continuous increase in federal expenditures. The second step is to substitute expanding private business for government-financed business as the principal foundation of expanding prosperity.

The increase in federal expenditures can be stopped without sacrificing any effective measures now directed toward meeting our top priority requirement—protection from armed Communist aggression. The most competent authorities of both major parties agree it can be done by (1) better planning of and the elimination of outright waste in defense arrangements, and (2) cutting those civilian expenditures which cannot be justified at the same time we are undertaking a great new load of defense expenditure.

It is also possible to substitute expanding private business for government-financed business. The problem is primarily that of relieving private business of the staggering load of federal taxation it now is carrying. Federal taxation now takes 52 per cent of all corporate profits and 82 per cent of all so-called excess profits. If it were not for the forced draft placed under our economy by rapidly mounting defense expenditures, this burden would surely lay a disastrous blight on private business expansion. If expanding private business is to have a chance to play its critical role as a substitute for government-financed business, its taxes must be cut, and soon.

It Won't be Easy

It would be naive to contend that it will be easy to check the expansion of federal expenditures. They have been running wild too long, and in the process contributing to a feverish, inflationary prosperity. Likewise, there is no reason to believe that the easing of the load of business taxes is going to be easy. The basic blight it puts on business expansion has been too long obscured by having our economy dosed with artificial stimulants, most notably enormous injections of federal expenditures.

The Key Question—How Long?

It is obvious that prosperity is going to be a major topic of discussion in the present political campaign. There is nothing the matter with that. Prosperity is a key concern of the voters in choosing a national administration.

To make the discussion of prosperity really useful, however, it is important to ask and get answers to the right questions about it. The key question is not whether or not we have prosperity. That we have it in large measure is generally conceded.

The key question is, "How long can we continue to have prosperity?" The answer—not very long if we continue to rely primarily on new injections of inflationary federal expenditures. Santa Claus, be it remembered, is no youngster. If we continue our present improvident course, he will be worked to death. Those politicians, regardless of party, who see this clear danger and who have plans to escape it are facing up to the crucial question about our prosperity.

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"Big Red" TD 24 digs deep at Mesabi

"BIG RED" BLENDS ORE with a bulldozer in one of Mesabi's huge open pit mines. The TD-24's 148 maximum drawbar horsepower makes this hard job easy. So do its pivot-turns, feather-turns, turns with power on both tracks; its 8 speeds forward, and 8 reverse; its instant, all-weather, push-button starting—plenty important when the temperature drops! These advantages make the TD-24 the Champ for sure!

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For example, big red International TD-24 crawler tractors—the fastest and most powerful crawlers on the market—master many tough Mesabi jobs:

They strip off ever-deeper layers of overburden.

They constantly build new mine roads in Mesabi's great open pits—build them faster and easier than ever before.

They relocate railroad roadbeds the same way—again deep in the pits themselves.

They bulldoze together high-grade and low-grade ores, make usable blends to ship to the steel mills.

As a result of such ingenious and increasing use of modern machines, six tons of material is removed per man-hour today, where less than four tons were removed per man-hour in 1931.

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It's the rugged, rock-proved Type BD hydraulically dumped body featuring EASTON's patented automatic down folding side gate.

This fast, versatile hauler switches easily from job to job, handling rock, ore, earth or mixed loads over any road or grade that your chassis can negotiate. It's a newcomer, introduced a little more than a year ago, rapidly winning interest for fast, low-cost hauling in many types of off-highway service. For complete information ask your local off-highway truck salesman, or write to:

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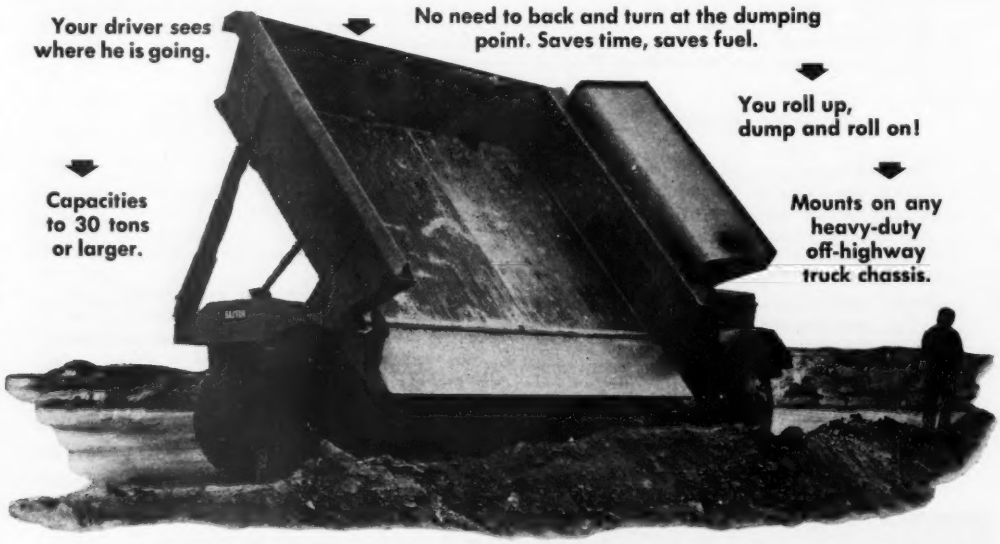
Now you can have these big side-dump advantages in a versatile side-dump unit


Your driver sees where he is going.
No need to back and turn at the dumping point. Saves time, saves fuel.
You roll up, dump and roll on!
Capacities to 30 tons or larger.
Mounts on any heavy-duty off-highway truck chassis.

EASTON SIDE-DUMPS

B-1053

Washington (*Continued*)

struction of a tin smelter in or near Seattle, General Superintendent Paul M. Sorensen, of U.S. Tin, has revealed at Fairbanks, Alaska. Cost of the smelter is estimated at $250,000.

The tin company plans to expand its operations at Lost River, 100 mi. northwest of Nome, Alaska, to provide a capacity of 5 tons of tin and tungsten concentrate every 24 hours from 200 tons of ore. The plant presently can process only 10 tons of ore per day. The concentrate, until the Seattle smelter is built, will be shipped to New York for processing for tungsten and then to Texas City, Tex., for tin smelting.

The Lost River expansion will include 20 concentrating tables and a 150-hp. diesel-electric unit.

WISCONSIN-ILLINOIS

★The **Homestead Mining Co.** has leased 2,000 acres of mining land in and near Platteville, and is constructing a 100-ton flotation mill at the Acme mine just outside the city limits. Officers are: Gerald H. Pett, president; Ernest Rasque, vice president; Raymond Piquette, treasurer; Warren Thompson, secretary, and Wilbert Lawrence, assistant secretary.

Three mines are located on this property: the Acme and Homestead mines which were last operated by Wisconsin Zinc Co., in 1914; and the Rasque orebody, which is virgin ground. The Acme Mine contains 50,000 tons of measured ore averaging 4½% zinc; the Homestead, 27,000 tons of the same grade; and the Rasque orebody contains 50,000 tons of measured ore averaging 11% zinc, with considerable amounts of galena.

It is planned to operate only two of the three mines at any one time. The Acme will be first in operation and will produce 100 tons per day, which will be concentrated in the jig mill to 35 tons of flotation feed, the remainder to be supplied from the Rasque Mine. The Homestead Mine will be cleaned out and dewatered later as the need for further ore develops.

The shaft on the Acme property has been cleaned out under a contract with Leo Klein Construction Co. A clam shell was used and the 160 ft. of shaft was cleaned out in 10 days. A 10-in. Lane Northwest pump of 2,000 gallon rated capacity is being installed to dewater the Acme. It is estimated that four weeks will be required to dewater this mine and that one week will suffice to clean out the old workings. Underground haulage will be by deisel trucks loaded by an Eimco loader and by a Ferguson Skyline loader known as the "Bombadier Track." The latter is being used experimentally for underground loading, but has performed satisfactorily in surface operations. One-hundred tons of mine rock hoisted from the Acme daily will be first treated in a 42 in. x 48 in. seven-cell center feed steel jig and concentrated to 12-14% metallic zinc, making 35 tons of flotation feed which will be further concentrated in the flotation mill to marketable grade.

The Rasque orebody is located 5 mi. south of Platteville. A 6 x 10-ft. shaft is being sunk on the Rasque in a manner different than usual in this district. The round is drilled and blasted and the dirt cleaned out of the shaft by clam shell. A pump set in a 15-in. drillhole located 6 ft. from the shaft is keeping the shaft dry and an average of 15 ft. per day is being sunk by two shifts. Ore from the Rasque mine will be hoisted by cans and grizzlied before being hauled by truck to the Acme mill where it will be fed directly to the flotation unit.

The Homestead mine, ¾ mi. west of the Acme is within the city limits of Platteville. The shaft will be cleaned out by the clam shell as was the Acme and ore hauled by truck to the mill at the Acme. The Homestead ore will be treated in jig and flotation units.

★The Blaney Mining Co. of Madison has completed cleaning out the shaft and dewatering the Dark Horse mine in the village of Linden, Wis. The Dark Horse mine was last operated by the Optimo Mining Co. in 1917. The 6 x 9 ft. shaft is 110 ft. deep and bottoms in glass rock. Two levels were

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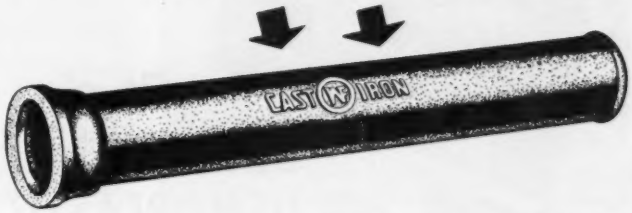

Here's Cast Iron Pipe that's tough, resilient, s-t-r-o-n-g . . . made to provide maximum service, long life, because it has the proper crushing, beam, shock and bursting properties.

Here's Cast Iron Pipe (with fittings) made in any size from 2" to 84", with all types of joints for ease and speedy installation wherever used.

For non-standard patterns, WARREN special castings in medium to heavy weights help you solve many installation problems. Also available in grey iron and Meehanite iron. Look for the WARREN W F trademark . . . it's your assurance of the best cast iron pipe that money can buy!

Specify **WARREN**
CAST IRON PIPE...
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Flexible Joint Pipe • Short Body Bell & Spigot Specials
WARREN PIPE CO. OF MASS. INC. 75 FEDERAL ST. BOSTON, MASS.

95 Years of Continuous Service

Wisconsin-Illinois (*Continued*)

operated, the upper one in grey limestone and the lower one in oilrock and glass rock. The Blaney Mining Co. is starting operations on the upper level. The ore will be jigged in a four-cell jig at the Dark Horse and shipped to the Meekers Grove Mining Co. flotation mill 12 mi. to the south.

★At present writing, workers at the Calumet mine of Calumet-Hecla Consolidated Copper Co., Wisconsin Branch at Shullsburg are out on strike (since June 28) to protest a 20c per hour wage cut by the company when the price of zinc fell to 15c per lb.

IN CANADA

★Canadian Gold producers aren't exulting over the fact that American funds have been selling this summer at a discount in Canada. Neither are base metal mines, most products of which are sold in the United States; and, which, like gold mines, are receiving less on that account than they were a year ago. The gold mines, however, have the unique distinction of a "fixed" price—$35 (U.S.) per oz. (Those which have elected to sell in the premium market receive more, but they have had to forego cost-aid, and so are not numerous.)

Things have accordingly been bad enough for the golds all along, with costs rising steadily while selling price stayed constant. Prior to September, 1950, it was constant at $38.50, thanks to the U. S. premium; of late the price has been slipping, and early this month was below $34.

Cost-aid under the Emergency Gold Mining Assistance Act has done a splendid job of protecting the mines against rising costs, admit the mine operators, but it doesn't give any compensation for declining sales price. The margin of profit has been so slim for many of the golds, that further closings seem inevitable. The number of producers has already declined from 144 in 1941 to 60 in mid-1952.

Those gold mines which are selling on the premium market (including the base metal mines with gold as a by-product) are also adversely affected, as the world "free" gold price has declined this year. It looks now as though Canadian gold production for 1952 will probably not exceed $150-million. Last year it was $159-million; in 1950, $168-million; and in 1941, the peak year, it was well over $200-million.

BRITISH COLUMBIA

★**British Columbia's gold mining industry is facing a new squeeze**—a drop in gold value on one hand and demands for pay increases from miners on the other. The industry now is faced with a loss of nearly 4% on its gold which is sold to the Canadian mint at a fixed price of $35 per oz, United States funds. Since September, 1950, when the Canadian dollar was at a 10% discount until now, the loss has amounted to more than $4.50 per oz. Meanwhile, conciliation proceedings have started between the International Union of Mine, Mill & Smelter Workers and two major British Columbia gold mines, Cariboo Gold Quartz and Island Mountain. The union is seeking a 35¢ an hour wage increase.

★**Consolidated Mining and Smelting Co.** has approved a 10¢ hourly wage boost for its 5000 employees at Trail and Kimberley, boosting miners rate to $1.79½ hourly, and tradesmen to $1.88. International Union of Mine, Mill and Smelter Workers previously okayed the wage hike recommended by a conciliation board. Other recommendations of the board approved by both sides include one more paid statutory holiday to bring the total to seven. Regular pay plus time-and-a-half for work performed on statutory holidays; first class tradesmen now receive $1.74 per hour to get an additional 4¢ over the general 10¢ increase; men transferred from a job in the lead area due to lead stripping to lower paid work to get regular full pay if they have had eight years' service, or an additional 25% of the difference between their regular pay and the lower category rate, if they have

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OSMOSALTS and OSMOPLASTIC
the MINE PROVEN wood preservatives that make timbers last 3 to 5 times longer
With labor costs UP and profits DOWN, here's important news for you! By OSMOSE TREATING all timbers for *permanent places*, it's possible for you to SAVE AS MUCH AS 50% on your annual timbering bill. This is not our claim! Mining men everywhere are making this statement.
Osmose-treated timbers last 3 to 5 times longer and SAVE YOU not only the cost of new timbers . . . but also the labor cost of replacement, which amounts to more than *twice the cost of the timbers*. You can (1) Treat your own timber with inexpensive Osmose products or (2) Order ALL TYPES of Osmose-treated mine timbers from us. Either way you save PLENTY! Write for details.
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STANDARD ENGINEER'S REPORT

DATA

LUBRICANT Calol SA Grease

UNIT 4 1/2" anti-friction bearings

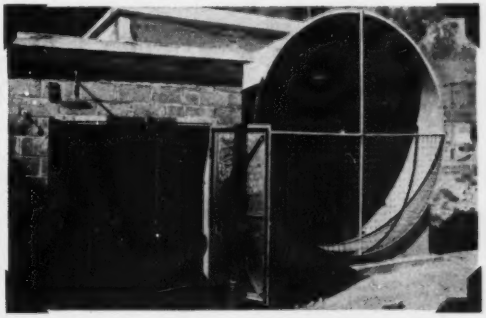
LUBRICATOR Grease gun

CONDITIONS Continuous operation, extreme temperature variations

PERIOD 4 Years

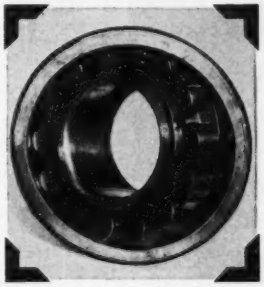
FIRM U.S. Fuel Company, Hiawatha, Utah

Special grease stays soft at 20° below zero!



PUMPING 250,000 CUBIC FEET OF AIR PER MINUTE at the King Mine, Hiawatha, Utah, this exhaust fan must work continuously in a place where winter temperatures often reach 20° below zero. Even in this extreme cold, Calol SA Grease stays soft—does not channel, allow grease starvation and loss of bearings as was the case when other greases were used. Since using Calol SA Grease, U. S. Fuel Company has had no trouble with fans, a major point since men must be brought out of the mine if fan stops.

CALOL SA GREASE has been used by the King Mine in 4½-inch bearings like this for more than four years. They have not lost or changed any bearings in that entire period! They have also used Calol SA Grease to lubricate mine car wheels—and it stayed in, did a good job, even under heavy loads!



REMARKS: Calol SA Grease has a wide range of uses. It is especially valuable for anti-friction and plain bearings operating in extreme temperatures.

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CALOL

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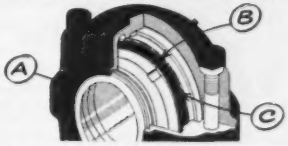
How to reduce wear in all types grease-lubricated machine bearings



Specialized CALOL SA Grease will provide constant lubrication in high ambient and bearing temperatures—proved in mill ambient temperatures of 250°F. and Navy Ball Bearing Machine tests of 10,000 rpm and extreme temperatures.

A. Made from sodium-aluminum base...very high melting point minimizes seepage.

B. Feeds evenly to all bearing surfaces.

C. Remains soft in cold temperatures.

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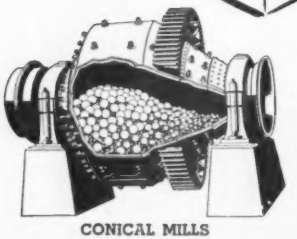
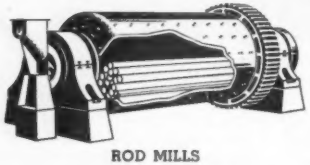


CONICAL MILLS

HARDINGE MILLS

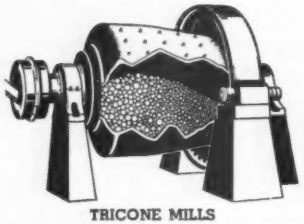
CONICAL MILLS
—The Hardinge Conical Ball (or Pebble) Mill is unequaled in efficiency. Grinds wet or dry, in open or closed circuit. Outstanding feature: natural size segregation of grinding media, from feed to discharge. Bulletin 17-B-1 for dry grinding; Bulletin AH-389-1 for wet grinding.



ROD MILLS

TRICONE MILLS
— Same ball segregation effect as obtained in the Conical Mill, pus additional grinding volume. Ideal for large capacity operations. Bulletin AH-414-1.

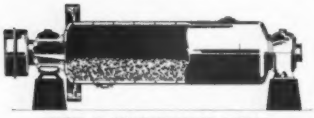
ROD MILLS
— Ideal for producing minimum oversize in open circuit grinding. Grinds either wet or dry. Convex heads reduce friction, prevent congestion of charge at the ends, and align the rods. Bulletin 25-B-1.



TRICONE MILLS

TUBE MILLS
— For a fine product in open circuit without the use of classifiers. For mixing and grinding to secure a smooth texture or plastic product. Bulletin 18-B-1.

CYLINDRICAL MILLS
—The Cylindrical Ball (or Pebble) Mills have demountable trunnions, and convex heads to reduce head liner wear and increase mixing action. Supplied with or without grates, as required. Bulletin AH-389-1.



TUBE & CYLINDRICAL MILLS

See District Office Addresses on Opposite Page

HARDINGE

British Columbia *(Continued)*

more than two years' service. Workers originally asked for a 35¢ increase.

★**Steel strike in the United States** staved off a move to reduce the rate of shipment of British Columbia iron ore to Japanese mills which had asked suppliers to reduce deliveries. The Argonaut Co., with a $4-million iron ore operation at Quinsam Lake, Vancouver Island, continued shipments full blast in July. Shipments are totalling some 60,000 tons a month, some seven to nine ships. The company has long-term contracts with the Japanese mills, which recently have found demand for their products brisk, in contrast with an earlier fear of overstocking.

★**United States Smelting, Refining & Mining Co.** is moving into British Columbia to carry on exploration and development work. The firm has been registered under the Companies' Act at Victoria, the provincial capital.

★**International Lead & Zinc Mines Ltd.** is starting exploration of its claims adjoining and south of the Reeves MacDonald lead and zinc mine, near Salmo. Edward G. Brown, of Vancouver, president, said the firm will start shaft sinking, geophysical and geochemical investigation and diamond drilling.

★**Van Roi Consolidated Mines Ltd.**, near Silverton, has been forced to close down its mill because of lower metal prices and mining difficulties after little more than half a year's operation. Net smelter returns have been cut 30% by price drops and loss of the U. S. dollar premium.

★**Ainsworth Base Metals Ltd.**, will start construction of a 50-ton mill immediately at its silver-lead-zinc property adjoining the Cork-Province mine near Kaslo.

★**Blue Jack mine**, near Brandywine Falls, Lillooet district, has been returned to production after being inactive since depression days. Lead-zinc ore is being shipped. The provincial department of mines provided a grant to build 2½ mi. of road and a bridge to the property.

★**Yale Lead & Zinc Mines, Ainsworth,** in the Kootenays made a net profit of $247,939 in the seven months ended Dec. 31. Milling operations started in April, 1951, and shipment of lead and zinc concentrates to Trail smelter started in May. Seven months' production amounted to $620,899, and brought an operating profit of $254,739. Additional crushing equipment is being installed in the mill to raise average daily production from 175 tons to 250 tons. Increased tonnage is expected to offset the drop in prices.

★**Jackson Basin Mining Co. Ltd.** Kaslo, has found a 46-ft. length of high-grade zinc ore averaging $84.56 per ton, in the development of the No. 6 level.

★**Quatsino Copper Gold Mines Ltd.** is

increasing development of its Vancouver Island magnetite iron ore property, with an airlift speeding delivery of equipment. Two drills are being operated 24 hours a day and a geophysical and dip-needle survey is under way. The company reports a substantial tonnage of ore has been indicated by work in only 250 ft., along the contact. Surface exploration has established that the favorable contact extends at least 8000 ft., with numerous showings.

★**Cominco's Bluebell mill at Riondell** already has exceeded its rated capacity of 500 tons daily and it is anticipated output will be boosted to 1000 tons. Construction at the H. B. mine in Salmo district is on schedule and the 1000-ton mill there is expected to go into operation by fall.

MANITOBA

★**Gunnar Gold Mines Ltd.** announces that diamond drilling is to commence on its chromite holdings in the Bird River area. The program will investigate anomalies previously outlined by a magnetometer survey. Further drilling will be done on the main orebody. Metallurgical work will be carried out to determine a satisfactory method of producing chromium metal from the ore.

★**Hudson Bay Mining & Smelting Co. Ltd.** announces that a crosscut has been put out on the 4,500-ft. level to explore the new ore zone recently discovered in diamond drilling.

Exploration work at the Schist Lake mine is continuing with development ore being trucked to the main plant for treatment. It is proposed to put the mine on steady production basis in the near future.

At the North Star mine the shaft is down to 600 ft. and crosscut is being driven 700 ft. under the lake to explore the adjoining Don Jon property (80% H. B. owned). Ore from these properties will be trucked 19 mi. to Flin Flon for treatment.

A geophysical and diamond drilling program is being carried out at Birch Lake, Sask. where the company has staked and acquired large holdings.

In the Kluane Lake area of the Yukon, the company has taken an option on two large groups of claims where an important nickel-copper discovery gave 3.2% nickel, 2.2% copper and 0.14% cobalt over 48 ft. Diamond drilling will be carried out shortly.

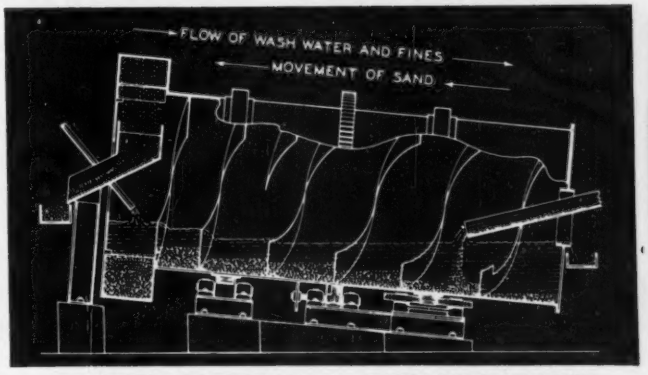
ONTARIO

★With its $3-million production loan fully repaid and mine development certain to show a substantial increase in ore reserves at the end of the year, **Campbell Red Lake Gold Mines** is quickly approaching the dividend stage.

This Dome-controlled unit has developed sturdily during the past year

IS YOUR PROBLEM

WET CLASSIFYING



HARDINGE WET CLASSIFIERS

Counter-Current Classifier built by Hardinge produces closer sizing and cleaner oversize because of its unique construction. It consists of a slowly rotating drum, on the inner surface of which is attached a screw flight. The coarse material is separated from the fines through the action of gravity. The settled granular particles are rolled forward by the screw flight and washed with a counter-flow of wash water. The fines and wash water overflow through an opening at the discharge end. The oversize is elevated by buckets in the enlarged portion and discharged. Will operate in closed circuit with a grinding mill without the use of conveyors or pumps. Bulletin 39-B-1.

Hydro-Classifier built by Hardinge is a large-volume classifier for fine separating problems. In combination with the Counter-Current Classifier, it provides positive control of sizing and moisture. Bulletin 39-B-1.

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Ontario *(Continued)*

with two new orebodies discovered in the north section, both well above previous mine average in grade.

★Another gold mine to do well this year is **Pickle Crow,** veteran and now sole remaining producer in the Pickle Lake area. The new No. 6 vein, discovered in No. 3 shaft area on the 1,600-ft. level, is one of the most significant developments of recent years. Initial drifting has shown more than 400 ft. of ore averaging $15.40 across 22 in. Drilling has proved continuity to a depth of 525 ft. below the level, and a raise has followed it upward to the 1,475-ft. horizon with channel sampling averaging $29.05 across 23 in.

★**Kerr-Addison** appears to be growing richer than ever. On the 2,650-ft. level, deepest in the mine, the main orebodies, No.'s 16 and 21, are running far above mine average. With about one-third of development completed, the former shows length of 452 ft., width of 22.5 ft., and grade of $18 per ton; the latter, a length of 430 ft., width of 48.7 ft., and grade of $14.

★Higher costs affected **Aunor Gold Mines.** Tonnage milled in the first six months was slightly up, grade was a little better, and the gold was sold on the premium market with the result that gold production rose from $1.23 to $1.36-million. Costs were up ($1,040,000 versus $864,500) and no cost-aid was received. As a result, net profit dropped from 12.16¢ to 10.2¢ per share.

★Mine-making plans will probably be announced this fall by **Falconbridge Nickel Mines** on its Fecunis Lake property adjoining International Nickel's Levack mine on the northwest rim of the Sudbury basin. Drilling this year has substantially enlarged the known ore potential, which had been estimated at 3.5-million tons at the end of 1951. Work is slow for the ore is deep (around the 3,000-ft. horizon), but one hole completed last month showed a thickness of 600 ft. of typical Sudbury copper-nickel ore, about double the average of the first holes put down.

★Ontario's only straight copper mine, that of **New Ryan Lake Mines** in Matachewan, is now operating on a fairly constant basis and has been shipping two cars of concentrates a month to Noranda.

★Also in Matachewan, is Ontario's first lead-zinc mine to be established in many years. Production started last month at the property of **Matarrow Lead Mines,** managed and financed to milling by Matachewan Consolidated Mines, subsidiary of Ventures Ltd. The ore is trucked to Matachewan's mill, part of which was revamped for the purpose. Planned treatment rate is 200 tons daily, with expected millheads of 9.6% combined lead and zinc.

Cleveland Air Vibrators

Jones & Laughlin Steel Corporation is beneficiating low-grade iron ore at its Star Lake, N. Y., mine by crushing, grinding, concentrating and finally sintering.

In the sintering operation, as can be seen in the photo above, Type F CLEVELAND air vibrators are used to prevent build-up of the sticky ore on the inclined plate, which directs the mix to the hearth and also serves as a leveling board to control depth of the bed.

J & L has found that continuous cleaning by the CLEVELAND air vibrator produces a more uniform bed level and relieves the operator of dislodging built-up material.

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Catalog No. 105 gives complete details.

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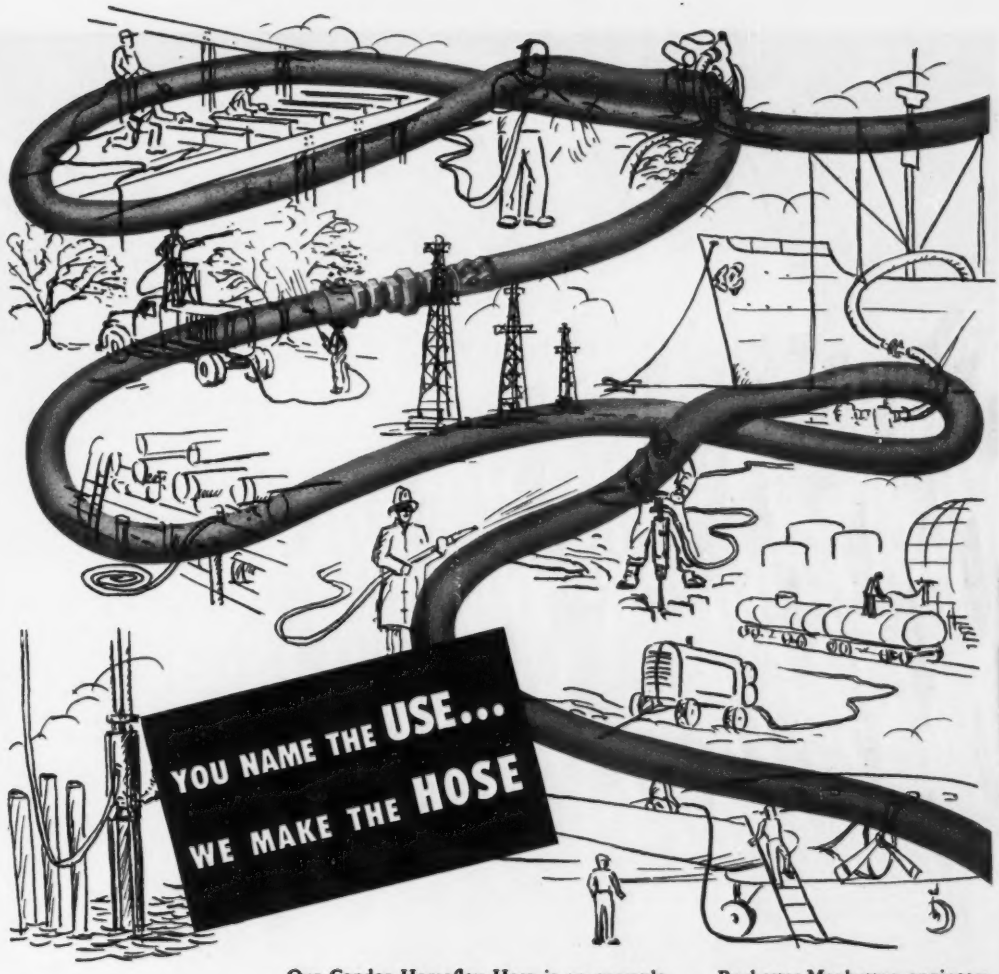

Our Condor Homoflex Hose is an example . . . Raybestos-Manhattan engineers found a way to build strength into a hose-wall without simply adding weight and thickness in more plies. The result, this Hose is flexible as a rope . . . and a real labor saver wherever men must constantly work with hose. On the other hand, Raybestos-Manhattan makes the world's *largest* and *heaviest* hose for oil drilling and loading, and for suction • Hose may not be your problem today, but whenever you think of industrial rubber products . . . transmission, conveyor, V-belts, or hose . . . remember R/M engineers have developed exclusive features to give you more for your money in every use. Consult your R/M representative.

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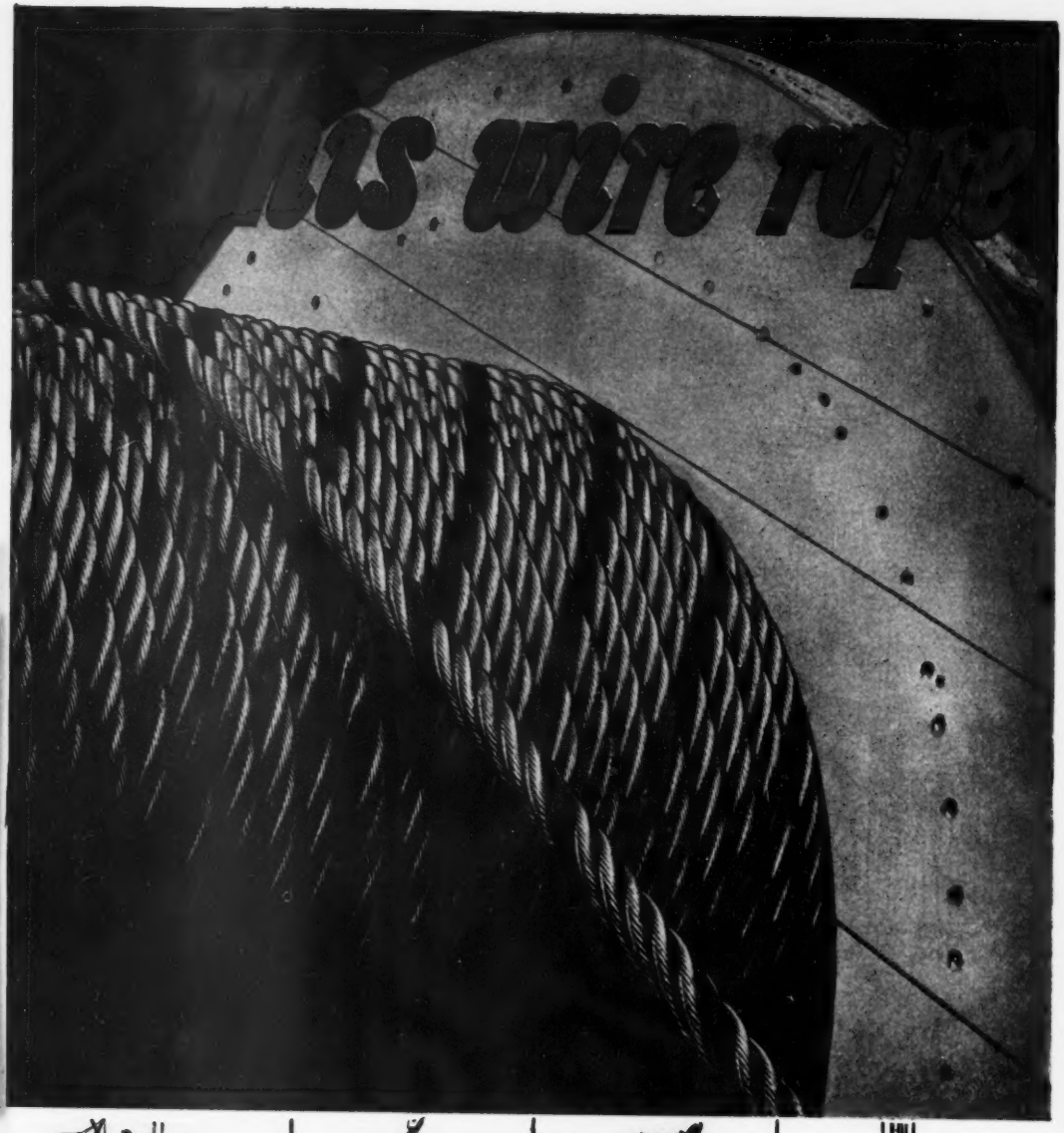
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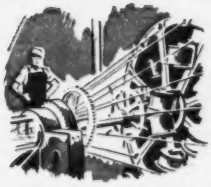

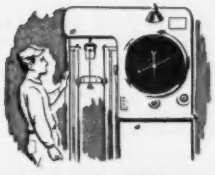

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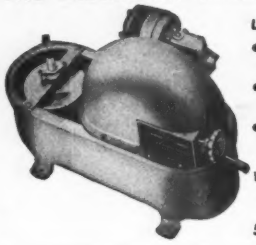

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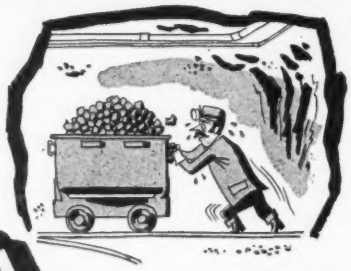
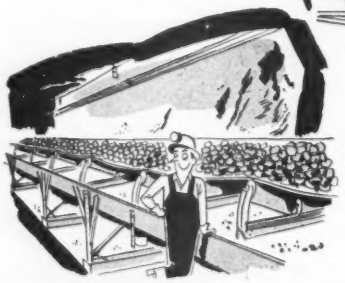
Canadian MINING ON THE MARCH

Earliest method of transporting ore underground in Canadian mines was the hand tram, pushed by a muscular trammer. In many mines the hand tram is being replaced by the more efficient electric locomotive.





Latest type of underground carrier is the conveyor belt, a permanent installation used in larger workings. The longest conveyor belt in the world reaches two miles under the sea at the Wabana Iron Mines in Newfoundland.

Because Canadian mining men are alert to the needs of their industry, Canadian mining has made spectacular strides in the past few decades. And in the development of new steels for better mining tools, Atlas Steels Limited of Welland have kept pace with the march of mining.

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QUEBEC

★Big news of the Noranda half-yearly report was that underground work has been started at the property of **Gaspe Copper Mines** in Quebec's Gaspe Peninsula. The main adit has been driven 1,000 ft., about two-thirds of the way toward the point where it will meet the vertical shaft that is planned. Town-site construction has also started, and plans are being drawn up for the smelter.

Drilling this year has increased Gaspe ore reserves to 67-million tons, an increase of 2-million tons since the end of 1951. Grade is in the neighborhood of 1% copper.

★All phases of bringing the **iron ore deposits of Labrador-Quebec** to production are up to schedule. By year-end, 175 mi. of the 360 mi. railway from the St. Lawrence to the mines will have been completed, and it will probably all be finished before the end of 1953. Good progress is being made, too, on the docks and railway terminals at the port of Seven Islands and on the dam at the Menehik power site. Officials of **Iron Ore Company of Canada** are talking quite confidently about starting production in 1954.

★Diamond drilling has been started by **Laurentide (Chibougamau) Mines** on its ground in Ely Twp., southeast of Sherbrooke in the Eastern Twps. The property is a copper prospect, one of the oldest in the province, on which the metal was first noted in 1865.

★Drilling is also being started by **Marbenor Malartic Mines** on its group adjoining Malartic Gold Fields in the Malartic area. A series of deep holes is being put down in an effort to enlarge the picture obtained previously in shallower drilling.

★Good progress is being made in mill construction by **United Lead and Zinc Mines** and **Montauban Mines** operating jointly on their adjoining properties in the Anacon district, 70 mi. west of Quebec City. Start of production is scheduled for the coming winter. Similar progress is being made with underground work, the joint shaft having been completed to 500 ft. some weeks ago, and lateral work is well advanced on the 240-ft. level. In the meantime, new interest has been added to the United Lead situation by discovery of a gold zone, believed to be the northerly extension of Anacon's similar show. On United ground it has been traced by drilling for 500 ft. with average of 0.25 oz. gold and 1.83 oz. silver per ton across average core length of 5.7 ft.

SASKATCHEWAN

★Greatest staking rush in Saskatchewan's history was due to start August 4 when parts of 20 mining concessions in the Beaverlodge uranium field was opened to public staking. Between 500

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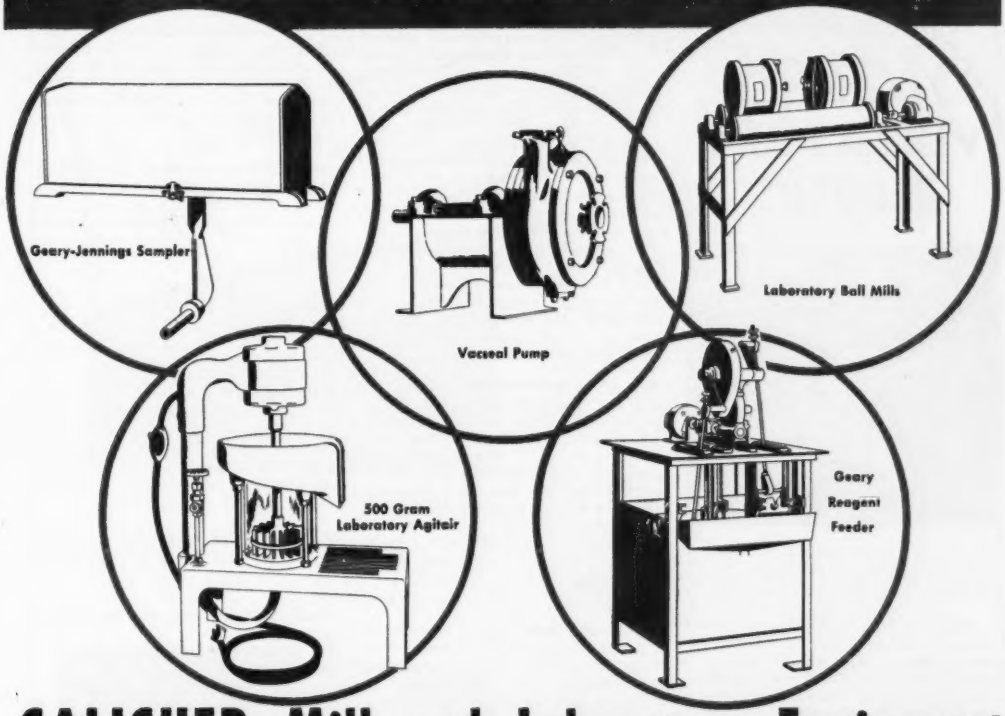

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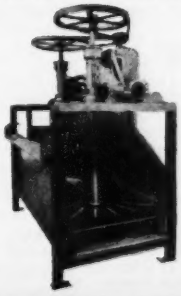

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Saskatchewan *(Continued)*

and 1000 claims were expected to be staked. The mining concessions were granted to various mining companies three years ago, and work commitments called for in the three-year contracts have been completed.

★**Validity of Saskatchewan's Mineral Taxation Act** has been upheld by the Supreme Court of Canada, which disallowed an appeal by the Canadian Pacific Railway. The case was started in 1948 by the CPR to test the validity of the act which levied a 3c-an-acre tax on all privately-owned mineral rights and a variable tax on producing mineral areas where rights are privately owned. Saskatchewan Supreme Court Justice Thomson dismissed the CPR action originally, and the provincial Court of Appeal later ruled sections of the act dealing with the tax on producing areas ultra vires. The CPR then proceeded to the Supreme Court of Canada, and lost. The case can now go to Privy Councils.

★**National Explorations Ltd.** of Vancouver will proceed with shaft sinking at its Beaverlodge uranium property. Equipment for the job has been ordered. Dr. J. T. Mandy, consulting geologist and engineer, has recommended that the first level from the shaft be run at a depth of from 75 to 100 ft.

YUKON

★**Mackeno Mines Ltd.**, is reported to have an estimated ore reserve at its Mayo district property of 48,000 tons averaging 35.5 oz. silver, 11.6% lead, and 2.2% zinc per ton. It is thought a 150-ton concentrator might be planned for about $400,000, with Mackeno financing 25 to 33% and other operators in the area cooperating. An option has been taken on a suitable plant and it is hoped to put construction under way, with production before 1953. Rights have been offered shareholders to provide funds for building a 106-ton mill to start. Drifting is progressing on the third level between present workings and the boundary of United Keno Hill.

★**Yukeno Mines Ltd.**, H. W. Daring, president, is reportedly considering organizing a milling company with its neighbor, Mackeno Mines Ltd. It is to be used as a custom mill to treat ores from other mines.

★According to T. R. Clarke, general manager at the **Formo claims** in the Keno Hill area, exploratory work from the 2,700 ft. adit is proving satisfactory, with plans for opening a second level adit.

★**Yukon Consolidated Gold Corp., Ltd.** is operating seven dredges this year. Production at the company's operations last year was valued at about $1,930,000 in gold. This production came from seven dredges.

IN LATIN AMERICA

MEXICO

★The National Transformation Industries Chamber of Mexico urged the federal government to enact the Monetary Law against some large, but unnamed mining companies for doing business on a dollar basis. The law demands that all mercantile transactions in Mexico be done on a peso basis.

★**Cia. Minera de Real del Monte y Pachuca, S. A.**, Hidalgo, which the federal government acquired from private owners in 1945, invites miners to sell it gold and silver suitable for cyanidation as well as complex sulphides of copper, lead and zinc. J. Jesus Carrasco, mining union secretary general, asked the Labor ministry to order Real del Monte to stop cutting wages on the basis of a sliding scale in the price of silver.

★By early 1953, Mexico will be among the important world purveyors of sulphur according to Banco Nacional de Mexico, S. A. Mexico will change from a net importer to a net exporter during the next year according to estimates.

★**The National Association of Small Miners** held a convention in August in

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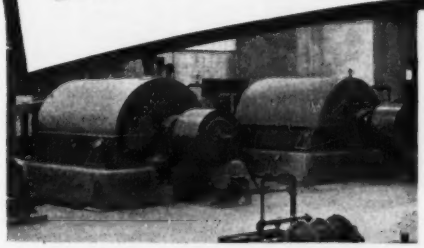
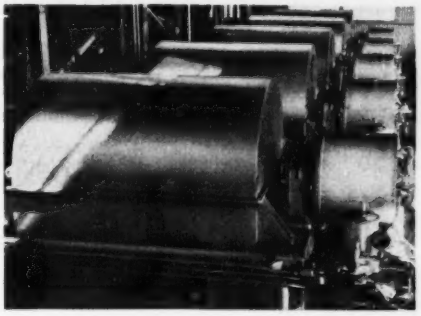


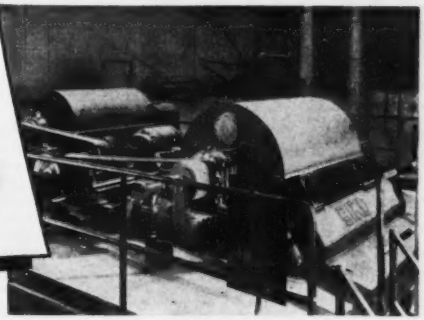
The BIRD Centrifugal CLASSIFIER

for splitting solids into definite size groups, from 200 mesh down to a single micron. Handles slurries from closed circuit grinding; deslimes ahead of flotation; classifies finished ground minerals. Capacity up to a ton or more a minute.



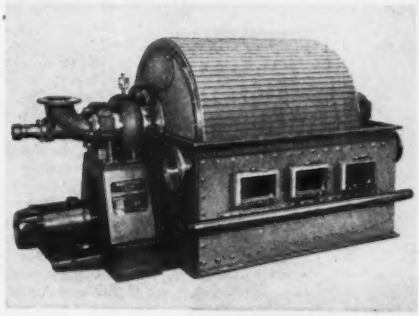
The BIRD COAL FILTER

dewaters fine coal (½″ x 0), gets it as dry as can be obtained mechanically. Handles a ton or more a minute at seven cents or less per ton for operation and maintenance. More than twenty million tons of fine coal have been put through Bird Filters.



The BIRD Continuous Centrifugal FILTER

for all kinds of concentrates, tailings, and mineral materials. No filter cloth, no vacuum, no auxiliary equipment. Handles feed slurries from under 3% solids to thickener underflows — solids from a fraction of a micron to ¼″ or larger.



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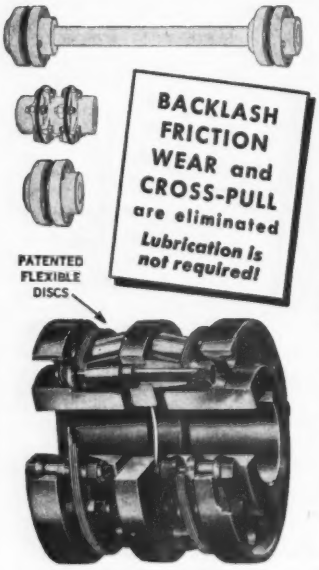

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Mexico *(Continued)*

which it was urged that taxes be levied on profits rather than production. The federation claims a membership of 3,000 operators and 20,000 employees.

BOLIVIA

★The American Smelting and Refining Co. through its Bolivian subsidiary, the Cia American Smelting Bolivana, S. A., notified the Bolivian Government on July 9 that it intended to suspend operations at the Corocoro mine at the end of 90 days in accordance with provisions of Bolivian law.

The company stated that the principal cause for the suspension of operations is the long history of labor disorders dating back prior to 1944 culminating in recent weeks in a situation wherein it was necessary for all the managerial and technical staff to be evacuated to LaPaz because of threatening actions by the Bolivian miners at Corocoro. Due to diminishing ore reserves and very low labor efficiency resulting from these continued disorders, the mine has a poor economic outlook and, accordingly, the company no longer feels that it can continue to pour new money into the operation.

Over a period of eight years, engineers, foremen, and other supervisory employees have left the property after having been threatened or beaten up by rioting groups of workmen. As a result of such intimidation, the company has lost many of its best employees, while discipline, particularly among the underground workmen, has seriously declined.

The Corocoro mine, located at Corocoro, Bolivia, has been operated under the management of American Smelting and Refining Company since 1934. Eight hundred fifty men are employed there and 300 tons of copper per month are produced in the form of concentrate.

BRAZIL

★Brazil will become virtually self-supporting in aluminum in about 18 months when Cia. Braseleira de Aluminio goes into production at its factory now under construction 75 km. west of Sao Paulo, CBA will have an initial output of 10,000 metric tons of metal plus an extensive foundry, rolling and extrusion mills, wire mill, aluminum paper mill and utensils manufacturing plant. Today Brazil's aluminum requirements run about 12,000 metric tons annually.

Initially, CBA will buy its power, but it has under construction a hydro station near Rio Jaquia which will be able to produce about 240,000 hp. Planning of CBA was started in 1941, but was delayed because of the war. In 1946 design and supervision contracts were let to Projectetazioni Sci-

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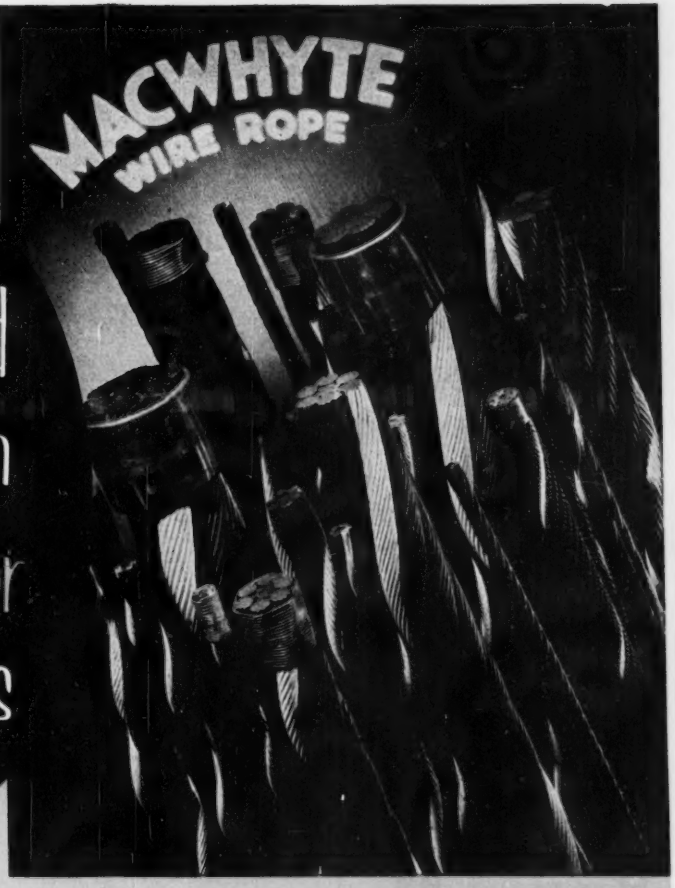

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3 208-S with plain shackle. Can be furnished with swivel hook or swivel shackle. Impervious to moisture due to patented grease seal. Extra-bread throat permits passage of knots and splices.

4 No. 180 Heavy Slusher Block. This block is designed for the heaviest slushing service, providing an extremely wide sheave and throat, and patented grease seal.

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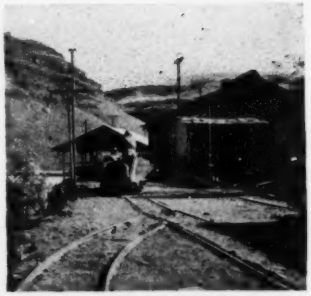
Brazil *(Continued)*

acca e Piacentini, of Bergamo, Italy—a decision based on the fact that Brazilian working conditions more closely resemble those of Europe than of the USA where initial equipment costs are higher. English, Danish, Swiss, Belgian, Italian, German, Canadian, Swedish, and American equipment has been supplied for the plant.

ARGENTINA

★Argentina has concluded a contract with the Fuji Iron and Steel Co. of Japan for the export to Argentina of 25,000 tons of blast-furnace pig iron.



WITTENOOM GORGE BLUE ASBESTOS operations. Proven deposits of asbestos in this field are reported "to be worth more than all of the gold ever taken out of Australia."

IN AUSTRALIA

★**Deposits of crocidolite,** or blue asbestos, in the Wittenoom Gorge area in Western Australia contain 344,000 tons to the square mile, according to the news bureau of the Federal Government's Interior Department at Canberra. The four known deposits are identified as the Wittenoom, Marramamba, Yampire Gorge and Dale's Gorge occurrences. At present the only lease worked is the Wittenoom Gorge.

The asbestos lies in horizontal seams. There are two seams in the Wittenoom field, the upper averaging 2¼ in. in thickness, the lower 2 in. The seams are 24 ft. apart, facilitating the recovery of the asbestos. They are mined simultaneously, the asbestos from the top seam being scraped via winzes to the edge of the cut and dropped into trucks working on the level of the lower seam.

At the treatment plant, the asbestos is stored in bins which deliver to picking belts. Here impurities are picked out and discarded, and the asbestos is dropped through a chute to a series of cracking plants. In the first it is reduced to 4 by 2 in., the second brings it to 2 in. square, and the last reduces it to 1 in. square and fluffs up the fibre.

The asbestos is then put over vibrating screens for preliminary grading. First-grade fiber measuring 1½ in. and longer, and second grade measuring ¾ to 1½ in. are passed through a hammer mill and rolls. The fibre is removed by suction and bagged. Third grade material passes through the screen and is further crushed and screened to give maximum recovery of fibre.

The bagged asbestos is trucked to Roebourne 200 mi. away on the west coast. From here it is shipped to the eastern states of Australia for processing.

★**A $50-million loan** has been granted to Australia by the International Bank for Reconstruction and Development. About one-fifth of this will be spent for production of nonferrous metals and industrial minerals, and for other industrial developments. Production of copper, lead, zinc, tin, aluminum, tungsten, and pyrites will be increased. The loan will pay for tractors, earth-moving equipment, mining equipment and machinery, and equipment for concentrating, smelting and refining plants.

★**Pyritic ore reserves** at Nairne, South Australia, are estimated to total about 100-million tons, enough to take care of Australia's requirements to make superphosphate for several hundred years. Sulphur content is 10 to 11%. Initial sulphur production from these ores is expected to reach 30,000 tons per year.

★**Australian metal production** for 1951 was as follows: lead, 166,902 tons; silver 6,633,191 oz.; zinc, 77,010 tons; copper, 12,483 tons; tin, 1,459 tons.

★**The manpower shortage** in Australia's mining industry is easing.

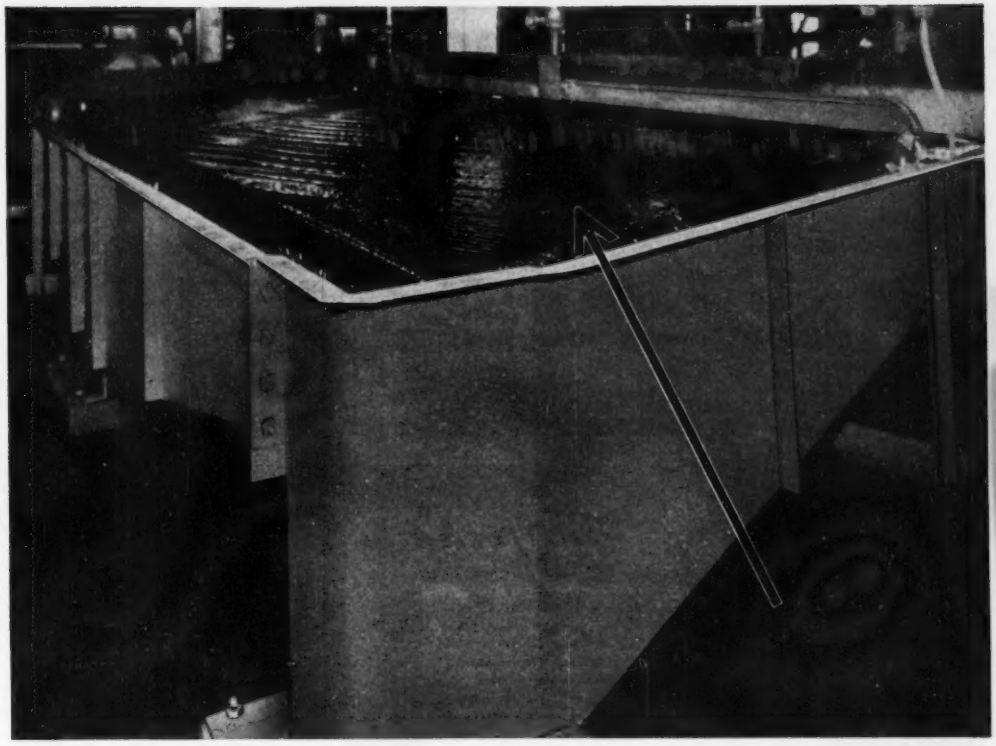
★**Drop in the average "premium" price** for gold is painfully felt by several gold producers in Australia. This coupled with rising costs may force some shutdowns of Australian producers.

IN ASIA

★**The South Korean Government** has started a $2-million program to expand output of tungsten ore from the present monthly level of 250,000 tons to 500,000 tons per month by May 1953. The ore is exported exclusively to the U. S. under a present trade agreement. Average content of the ore produced today is 1.4%.

★**The Indian Government** has been studying various methods whereby the output of iron and steel could be increased from the present output of 1.5 million tons to about 1.8 million

How does U. S. Rubber help launder coal?



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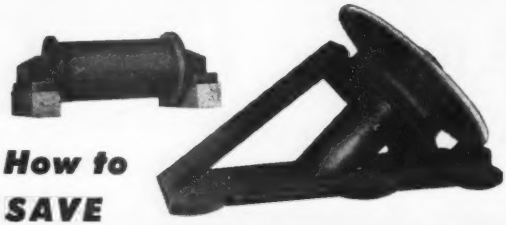

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Asia *(Continued)*

tons. G. D. Woods, leader of a World Bank mission which recently visited India, said that he would recommend a loan for the immediate expansion of India's iron and steel industry. The Indian Government also plans to augment aluminum production to relieve the present shortage of about 11,250 tons yearly.

★Tokyo Gas Co. plans to **extract germanium from ammonia liquor** employing the process recently developed by Sogo Sekitan Kenkyusho (Coal Research Institute, Inc.). The pilot plant will produce the metal at the rate of 500 kg. per year. [Editor's note: Could be Japanese researchers have read the 1948 copy of Minerals Yearbook in which the statement is made:—"It has been estimated that up to 2,000 tons of germanium per year may be present in stack gases, flue dust, and ashes of plants burning germaniferous coals in the United Kingdom."]

★At the Okayama works of Teikoku Kako KK, a pilot plant will be started which will produce **200 tons of rutile monthly.** Metallic titanium will also be produced at the rate of 1.5 tons per month soon.

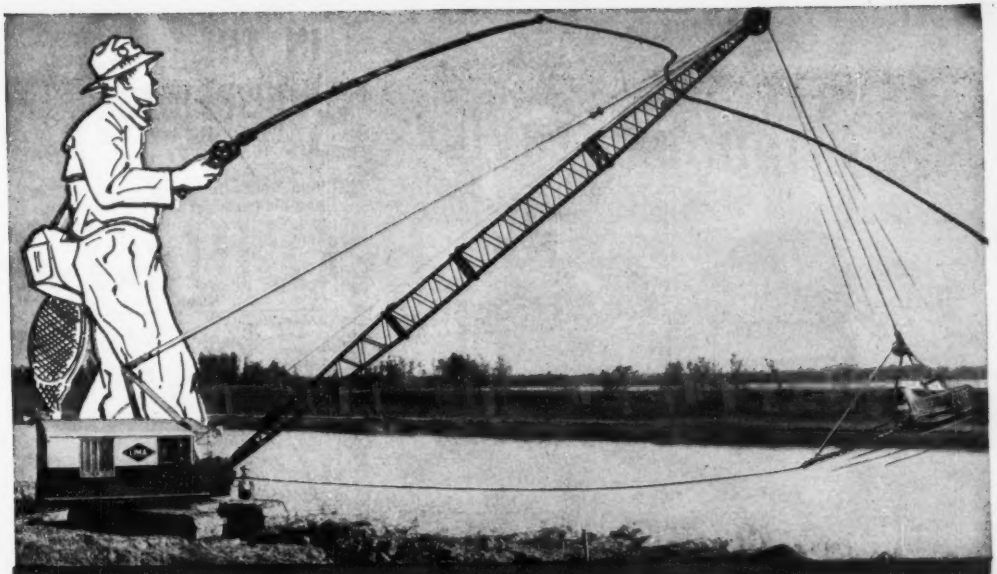
★Ishiwara Sanyo KK has signed a contract with the Glidden Co. of U. S. at the end of June to produce 500 tons per month of **titan white at Yokkaichi** by May, 1953. Ilmenite will be imported from the Anan mine, Sumatra. The ore is a by-product of the tin smelter there, and accordingly cheap in price. The titanium content is approximately 50%.

★**Osaka Tokushu Seitetsu KK** has started producing sponge titanium at the rate of 3 tons per month.

★A new process, more efficient than the Kroll process, is reported to have been developed by the KK Nippon Seikosho, enabling them to produce a rolling sheet without the HCI treatment and vacuum distillation. No argon is required in the refining process. Mg and Ti vapors are subjected to high-frequency currents in the presence of a certain catalyser. Pure titanium in the granular form (not powder) is precipitated. Cost is about half that of the Kroll process.

★**Prana, Ltd.,** a U. S. firm in Djakarta, Indonesia, has made an offer to the regency administration of Wonogiri to supply equipment to exploit the copper mines in the area, on condition that every month 500 tons of manganese mined in the area be delivered to the firm. The Wonogiri copper deposits run about 6%. Mining methods are very primitive.

★**Tongkah Compound No. 2** in Malaya is altering its tin dredge to increase capacity by 25%. Peninsula Tin of Thailand had to close the dredge because a nearby dam was carried away and torrents of water appeared to threaten the operation.



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When you're fishing, and want to drop the bait in the far pool where the big ones are waiting, your reel's got to be *friction-free* to let that line flow out, smooth as cream from a jug. And, after the strike, come in the same way.

When you're after record yardage, a smooth flowing line is just as vital . . . so we took a tip from the fisherman, and made our reels friction-free. You can 'cast' the dragline bucket further, increase your radius of efficient operation from each location. You can bring in bigger catches, because more power is going into the work lines and less into *friction drag on the machinery*. And there's further big benefits from reduced maintenance . . . less frequent lubrication, and smoother operation, because misalignment from bearing wear, that affects clutch alignment and functioning, is eliminated.

Lima pioneered the use of anti-friction bearings at all important bearing points on draglines, shovels, and cranes. They've kept on pioneering with other improvements that put Lima equipment in the top rank of profitable performers. If you want proof of this—just ask the Lima user. If you want details on how to put Lima equipment on your *pay-off* roll . . . just get in touch with us.

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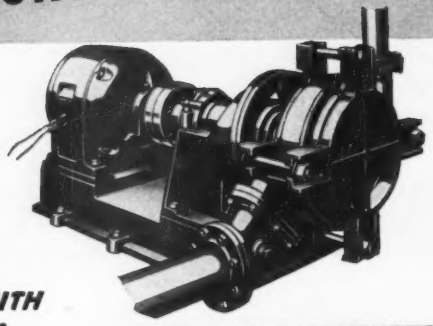

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The 4 features of the Morris Type R Slurry Pump mean low-cost operation ... minimum "lay up" time.

1. **Easily dismantled**—Impeller and shaft sleeve are renewable without disturbing piping or bearings.

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2. **Simpler design**—The Morris Type R Slurry Pump has no troublesome internal bolts or studs.

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3. **Corrosion-abrasion resistant**—You may have the Morris Type R with its moving parts in any of various metal alloys, depending upon the kind of slurry you handle. Parts are quickly interchanged.

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IN THE PHILIPPINES

★For the first six months of 1952, production of principal Philippine gold mines increased over the comparable period of 1951. The table that follows presents figures for January-June, 1952:

Mine	Tons Milled	Value of Gold Output at $35 per Oz.	Average Value per ton
Atok-Big Wedge	78,590	$714,295	$9.10
Balatoc	230,700	1,716,680	7.20
Benguet	212,210	1,679,160	7.95
Itogan	85,250	690,550	8.10
Mindinao Mother Lode	67,400	855,470	12.60
Surigao Consolidated	71,350	1,165,800	16.20

Gold production from Lepanto Consolidated is not included, as the company does not segregate in its monthly reports the value of the by-product gold obtained with its copper. Average gold content for these six producers was about 0.262 oz. per ton or $9.15 at the statutory price. Benquet-Balatoc operation accounted for nearly 60% of total tons milled, and about 50% of bullion recovered.

★Reopening United Paracale mine has proved to be unusually difficult. The water problem at the mine was always serious even in prewar years and required pumping about 4000 gpm. By the end of June the 400 level had been unwatered, but within 24 hours all the motors failed as a result of burned-out coils. This meant abandoning the levels below the 200 until repairs could be made. The old mine workings were found to be badly caved especially in the Longos section, which was formerly the most productive. The mill operated in May and June on a limited basis but it now appears questionable whether operations can be continued until further funds are obtained for rehabilitation expense. Before the war United Paracale was one of the leading gold mines of the Philippines. First shipments of concentrates from the mill in May and June showed considerable lead and copper recovered with the gold.

★**Martha Gold Mining Co., Ltd.**, of New Zealand, once largest New Zealand producer, is stopping work after 72 years of operation.

IN AFRICA

★**The largest combined aerial and ground search** for new mineral deposits ever undertaken with United States support will be launched early in September in Portugal's two largest colonies Angola and Mozambique, in southern Africa, according to the Mutual Security Agency. The U.S. and

More Up Grade Traction

WITH **OSHKOSH**

4-WHEEL DRIVE TRACTORS

CUT ORE HAULING COSTS BY DIVIDING TIRE WEAR AND HAULING STRESS OVER

2 DRIVING AXLES

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Service stations located at convenient points throughout the United States and Canada.

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POWERED BY 323 L.P. GAS HALL-SCOTT 400 ENGINE

OSHKOSH MODEL W-2209M
POWERED BY 300 H. P. CUMMINS NHRBS ENGINE

WRITE FOR NEW "OSHKOSH MINE BULLETIN" No. 101

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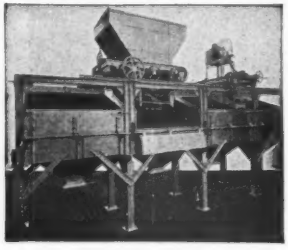

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Africa (*Continued*)

Portugal are sharing the cost of the project which will take 2½ years to complete. Cost is about $2-million. The Portuguese Government has concluded contracts with two private firms, the E. J. Longyear Co., of Minneapolis, and the Aero Service Corp. of Philadelphia, to undertake geological and aerial surveys respectively.

Purpose of the survey is to determine areas most favorable for intensive investigation of strategic material resources. Angola flanks the Belgian Congo, which is one of the world's major sources of uranium, and both Angola and Mozambique are favorably situated with respect to the important mineral producing zones of Katanga and Northern Rhodesia. The Portuguese requested survey is part of a plan to invite private investment into the two colonies to open up new mines, and develop the colonies.

The work of surveying the area would probably take 10 years if done on the ground, whereas the aerial survey is expected to accomplish this in 2½ years. MSA is providing a maximum of $800,000 to pay for dollar costs of the Longyear Co.'s ground survey, and $500,000 maximum for aerial mapping by Aero Service Corp.

IN EUROPE

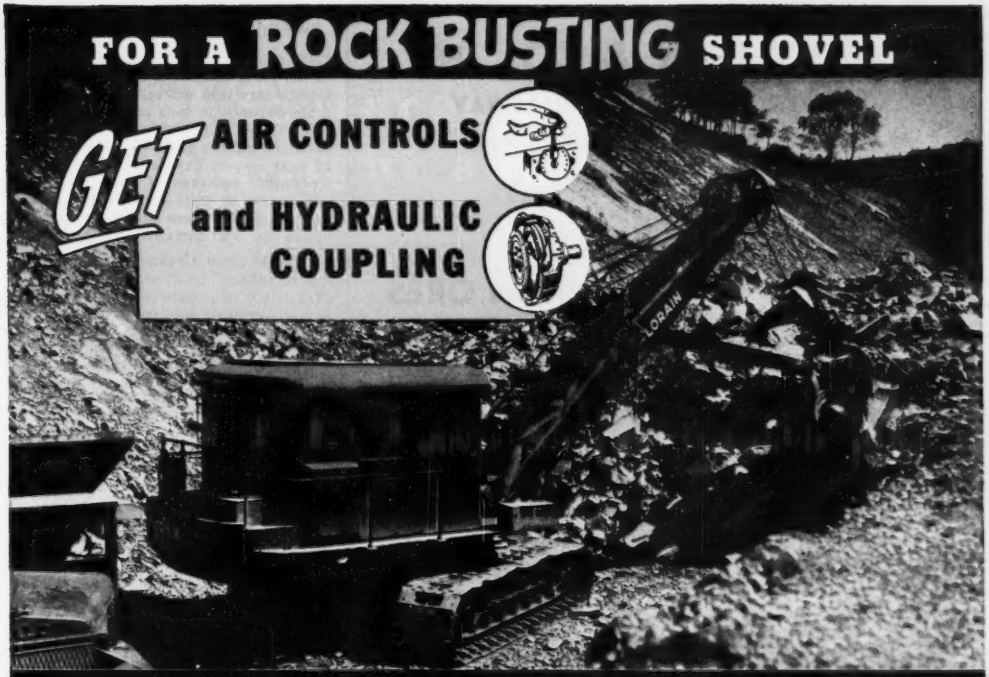
★According to *Pravda* improved technical methods have resulted in a **larger yield of copper ore from the Ural Mountains.** Copper pyrite deposits here contain about 20% Cu. It is estimated that in 1951, the Soviets produced 280,000 tons of copper from domestic ores against 255,000 tons in 1950, 180,000 tons in 1948, 165,000 tons in 1947, and 150,000 tons in 1946. Mine production in the Ural and Kasakstan are chiefly responsible for the increase.

★**Sydvaranger Iron Ore Co.'s Bjornevann mine,** which was demolished by the Nazis in 1944, is now back in production and is expected to produce a million tons of iron ore and concentrates annually by 1953. Overall cost of the reconstruction job was about $29-million. Of this amount, ECA-MSA is financing about $5-million worth of equipment available only in the U.S. including the $3-million already provided. The remaining $24-million is being financed by Norwegian sources. Equipment for the project came from 25 American firms.

★**Yugoslavia is potentially one of the richest storehouses** of mineral wealth, according to news reports and visitors who have returned from there recently. Some say the country could expand its mineral output ten-fold if it had a market for the products. Work is now under way on a copper mine and flotation plant at Majdanpek where exploration has shown proven ore of some 100-million tons running

FOR A ROCK BUSTING SHOVEL

GET AIR CONTROLS and HYDRAULIC COUPLING



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The finger-tip control of Lorain "Air-Assist" on crowd, retract and travel clutches makes it *easy* on the operator—yet retains the full "feel" of the machine so necessary for fast production in rock. Full air control of tread lock, steering, crowd brake, and jaw clutches lessen operator fatigue, increase yardage. And the final touch—a typically Lorain design bonus—*is that all air controls are equipped for mechanical or manual auxiliary operation.*

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Europe

0.9% copper. The Geological Institute of Serbia is sending a team to Vlasotince where iron ore reserves totaling some 200-million tons are reported to exist. Other iron ore deposits totaling about 30-million tons will be examined near Slepce, Tajmiste, and Judovo. Additional reserves of lead-zinc ore are known to exist near Trepca, but exploitation has been deferred because of the low lead content.

★**Exports from Cyprus** for the first five months of 1952 were as follows: 47,750 tons of copper concentrates, of which Germany received 25,850, U.S. 20,150, and Italy 1,750; 55,282 tons of copper pyrites, of which Italy took 29,210 tons, Germany 22,672, and Holland 3,400 tons; 232,459 tons of iron pyrites; and 4,304 tons of chrome ore.

★**The Yugoslav mercury mine** in Idrija produced 505,000 kilograms of mercury in 1951. The mine is expected to produce over 500,000 kilograms this year also, on the basis of the first five months' production.

★**Portugal exported 1,913 tons of wolfram** ore during the first five months of 1952, of which the U.S. took 843 tons and Britain 554 tons.

★Experimental drilling for sulphur is planned in deposits near Kongsvoll, Norway.

★**Swedish iron ore production** in 1951 was 15,390,000 tons, compared with 13,610,000 for the previous year.

★**Altos Hornos de Vizcaya,** Spain's most important iron and steel plant has made arrangements with German firms (M.A.N. and Schloeman) to receive machinery and technical advice. In 1951 this company produced 449,774 tons of pig iron, 471,511 tons of steel, and 8,566 tons of tinplate.

★Official British sources have disclosed that **Aluminium Company of Canada** will supply 2,640 tons of magnesium a year to U.K. over 20 years, beginning in 1954. The undertaking has been given in return for a loan of $2.2-million towards the expansion of the Aluminium Co.'s magnesium-producing capacity.

BOOKS

(*Continued from p. 144*)

face type. Thus we see; **"metamorphism** (Gr. *metamorphous* to transform) and **metasomatism** (Gr. *meta,* change; *somatos,* body)" and other similar basic terms included liberally in the reading matter. The book combines a nicely balanced coverage of mineralogy, history of early geologic ideas, igneous geology, structural geology, physical geology, as they are related to historical geology which is also interestingly presented in the concluding half of the book. Here we note an unusual but logical departure from conventional texts. The first half of the text ends with land forms due

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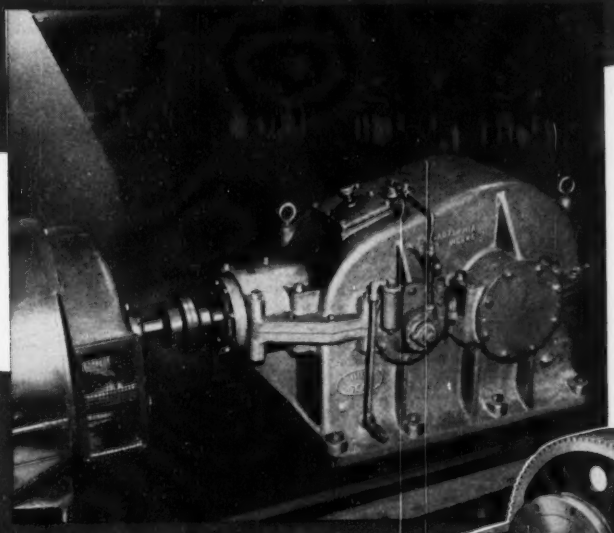

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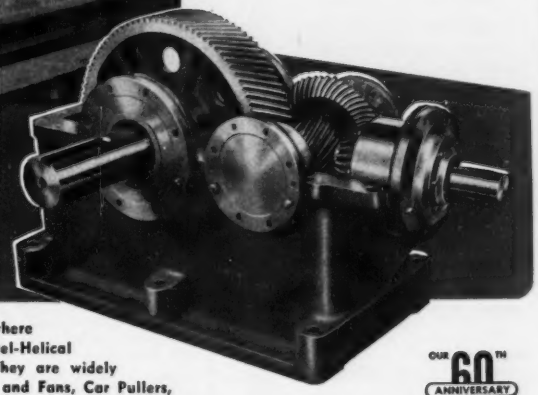

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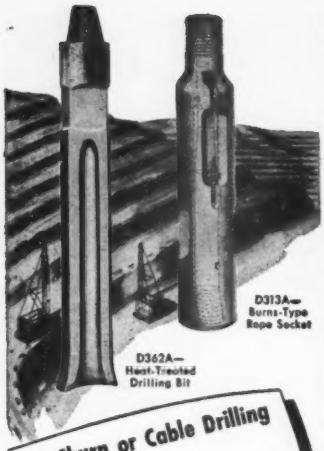

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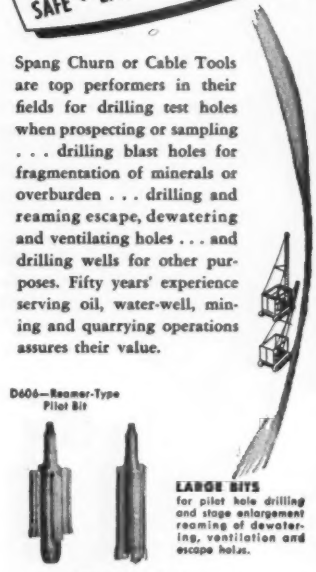

Books (*Continued*)

to glaciation. The second half on historical geology starts with Pleistocene Glaciation and works back to the Pre-Cambrian and origin of the earth in the concluding chapters. Published by McGraw-Hill Book Co., 330 W. 42 St., New York 36, N. Y. Pp. 730. Price $7.

Tool Steel Handbook. Published for engineers, teachers, metallurgists and others interested in tool, die and allied steels. The volume on tool steels includes charts and tables giving specific data on properties, analyses, and applications. Later chapters cover descriptions of important grades, forms and finishes for steels, and heat treating and handling. Available to qualified persons free from Allegheny Ludlum Steel Corp., Pittsburgh, Pa. Pp. 195.

Metallurgy for Engineers. (Casting, Welding, Working.) By John Wulff, Howard Taylor, and Amos Shaler, Department of Metallurgy, Massachusetts Institute of Technology. The authors wrote this book to convey two types of information to the reader who has to select and use metals intelligently: (1) Metallurgical principles behind metal processing, and (2) a thorough explanation of the processes themselves. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Pp. 624. Price $6.75.

The Geology and Mineral Resources of the Neighborhood of Kuantan, Pahang. Memoir No. 6 by F. H. Fitch, former geologist, Geological Survey Department, Federation of Malaya. Published by Geological Survey Department, Federation of Malaya. Kuala Lumpur, Malaya. Pp. 144 plus five maps. Price $6, Straits.

Dana's Manual of Mineralogy. Sixteenth Edition, revised by Cornelius S. Hurblut, Jr., associate professor of mineralogy, Harvard University. Many improvements and additions have been made in this widely-known text. Professor Hurblut has abandoned Dana's crystallographic nomenclature in favor of more simple and logical names used by others. The chapter or chemical aspects of minerals has been vastly improved. In fact, such topics as the relation of chemistry to crystallography, chemical bonds, ionic bonds, covalent bonds, metallic bonds, atomic packing, etc. will bring you up-to-date in simple readable language if you are a bit rusty in your mineralogy. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Pp. 530. Price $6.

Mechanics of Vibration. By H. M. Hansen, professor of engineering mechanics, and Paul F. Chenea, associate professor of engineering mechanics, both of University of Michigan. A well-balanced presentation of fundamental theory involved in study of vibration. Published by John Wiley &

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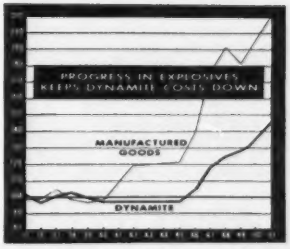

Chart shows relative stability of dynamite prices since 1935, as compared with prices of other manufactured goods. 1935-39 values = 100.

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Books *(Continued)*

Sons, Inc., 440 Fourth Ave., New York 16, N. Y., Pp. 417. Price $8.

Hydraulic Filling in Metal Mines. Special Report No. 12 released recently by the Division of Mines, Ferry Building, San Francisco, Calif. In this interesting and helpful volume, Wm. E. Lightfoot, the author, presents a historical review of hydraulic filling; properties of hydraulic fills; applications of hydraulic filling; and operating techniques covering preparation of the pulp, transportation of the pulp, and underground practice. Pp. 28, 15 Figs., Price 50¢.

Interpretation of Aeromagnetic Maps. By V. Vacquier, Nelson C. Steenland, Roland G. Henderson, and Isadore Zietz. Published by the Geological Society of America, 419 West 117th St., New York 27, N. Y. Pp. 151, including numerous tables and isogam maps.

Emphasis in this book is more on the physics governing interpretation of magnetic fields, than on geologic aspects of the subject. Magnetic surveys for seven areas in Maryland, Pennsylvania, Oklahoma, Arizona, and Alaska are analyzed. Maps for the areas are included in the backcover pocket. You'll have to brush up on your calculus to get full value from this text. It will be a valuable addition to any geophysicist's library.

Dana's System of Mineralogy, Seventh Edition. Volume II. Rewritten and greatly enlarged by Charles Palache, the late Harry Berman, and Clifford Frondel. This volume covers halides, nitrates, borates, carbonates, sulphates, phosphates, arsenates, tungstates, molybdates, and salts of organic compounds. Chief changes in the new edition are: a new mineral classification based on crystal chemistry; a new elastic series of classification numbers for species; a new form of presentation of crystallographic data; introduction of data derived from x-ray crystallography, and revision and expansion of other sections. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Pp. 1,123. Price $15.

Cooling Towers. By J. Jackson. Theory, practice and design are stressed in this text on cooling towers. Because of the increasing use of cooling towers in power plants, compressor plants, and mine refrigeration plants in the mining industry, this text has much to offer to mining readers. Various methods of producing cooling are discussed including: water as a cooling agent, spray towers, mechanical-draught towers, grid-packed induced-draught towers, gas-cooling towers, and transfer methods of cooling. Copies obtainable from Butterworth & Co. (Canada), Ltd., 1367 Danforth Ave., Toronto 6, Ontario. Pp. 104. Price $3.50.

The Science of Flames and Furnaces, by M. W. Thring, head of Physics Department, British Iron and Steel Research Association. This book provides "background" material and thinking which should be useful to anyone designing, installing, studying, modifying or correcting a furnace. Mr. Thring discusses flame furnaces only (no electric furnaces) in the broad fields of metallurgy and mineral processing. In the early chapters, he discusses function of furnaces, thermodynamics, heat transfer and other fundamentals leading up to the final two chapters: The Science of Furnace Construction; and The Application of The Scientific Method to Furnaces. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 416 pages. Price $5.50.

MacRae's Blue Book. Purchasing agents will find this classified directory of products of all kinds (and companies making these products) to be an invaluable aid. Published by MacRae's Blue Book Co., 18 E. Huron St., Chicago 11, Ill. Price U. S. and Canada, $15 f.o.b. Chicago.

Vermiculite. By E. R. Varley. A world survey of vermiculite including analyses, properties, marketing, preparation, and an account of occurrences in many countries of the world. A valuable booklet on this subject. Published for Colonial Geological Surveys, Minerals Resources Division. Available at Her Majesty's Stationery Office, London. Pp. 70. Price 7s 6d net.

Handbook of Engineering Fundamentals. Second Edition. Prepared by a staff of specialists under the editorship of Ovid W. Eshbach. About 39 specialists have contributed to this volume which is designed to cover fundamental laws and theories basic to engineering practice. Chapter headings in this revised and modernized second edition include mathematics and physical tables; physical units and standards; mechanics of rigid bodies; fluid mechanics; aerodynamics; thermodynamics; electricity and magnetism; radiation, light, and acoustics; chemistry; metallic materials; nonmetallic materials; and an index of engineering law. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, $10.

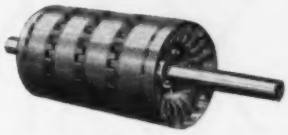
Correction

In H. A. Doerner's article "Can U.S. Use Its Low-Grade Domestic Chrome Ore?" *E&MJ*, August 1952, the following statement on p. 90 "Producers of ferro-chrome usually reject ores that contain less than three parts of iron etc." should be corrected to read "Producers of ferrochrome usually reject ores that contain less than three parts of chromium to one part of iron, because this ratio affects the grade of the product and smelting costs."

Which Answers Your Tramp Iron Problem BEST?

MAGNETIC PULLEYS?

Powerful, air cooled electro magnetic pulleys are ideal where well loaded conveyor belts are used. Installed as head drive pulley, tramp iron is discharged automatically. Low operating cost, long life and extreme power characterize this workhouse of the Dings line. Catalog C-1001A tells you why this magnet is exceptionally efficient.



Dings *non-electric, self-energized* Perma Pulley magnets are recommended where burden depths do not exceed 3". Within this range, these are the magnets to use because of their unsurpassed concentration of magnetic strength near the surface. Catalog C-1007A.

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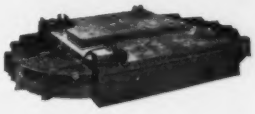
Power close and power that searches down as deep as 30" to yank tramp iron out. If the Dings RM rectangular won't do it, it can't be done. Triple pole, double gap design. Install horizontally, vertically or at an angle above belt conveyors or in chutes. Self-cleaning fully automatic models also available. Write for details.



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The Dings Magnetic Detector instantly signals when any magnetic object large enough to be damaging passes through the detector zone. Can be hooked up to sound an alarm and stop the belt. Ideal protection for crushers, grinders, pulverizers, etc., where belt speeds are so excessive or burden depths so great no magnetic separator can fuction successfully. Detectors are available for belt widths from 18" to 72". Two types are available. One employs an electro magnet and the other, a permanent magnet. Performance of the two is comparable.

Magnets shown here are available in size ranges for most applications. Special magnets can be made for any application. Write today for recommendations.

DINGS MAGNETIC SEPARATOR CO.
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XANTHATES

in greater concentration and maximum recovery!

Higher concentrate grade with Dow Xanthates makes flotation of sulphide minerals fast and complete—with every froth bubble loaded to maximum carrying capacity. And the extreme selectivity of these superior collector reagents always assures concentrates of good grade. The result is maximum recovery with minimum operational costs. To learn more about Dow Xanthates and the savings they can effect in your milling operation, write to Dow, Dept. OC 26A.

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

consider these DOW XANTHATES

Z-3 Potassium Ethyl Xanthate
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Z-5 Potassium sec-Amyl Xanthate
Z-6 Potassium Amyl Xanthate
Z-8 Potassium sec-Butyl Xanthate
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For livelier froth— use DOWFROTH 250

To its desirable characteristics of better frothing, better metallurgy and water solubility, Dowfroth 250 adds economy. In actual mill tests, frother consumptions *as low as one-fourth of normal consumptions* have proved satisfactory! Use this new frother for a froth that's livelier on the machine, quicker breaking in the launders and pump boxes—write to Dow, Dept. OC 26A for your free sample.

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CHEMICALS
INDISPENSABLE TO INDUSTRY AND AGRICULTURE

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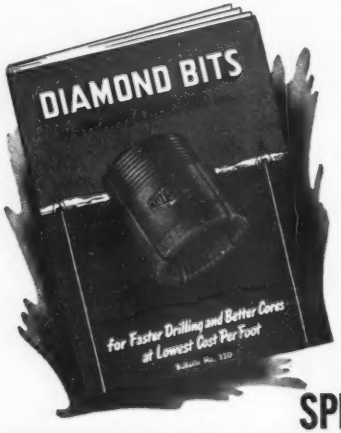
DENVER MINING CONGRESS

BOOTH NO. 406-410

New and Better Diamond Bits
for Modern High-Speed Drilling

ALWAYS a leader in its field, Sprague and Henwood, Inc. has been working for a number of years on the development of new types of diamond bits, to supplement their well-known "TRUCAST" bits, which are still unsurpassed for many diamond drilling requirements.

NOW, after having been thoroughly proved by Sprague and Henwood's contract drilling crews, under every variety of drilling conditions, these new bits are available to other users. Two new types of "Powdered Metal" matrices; improved "Cast Metal" matrices; "Impregnated" coring bits; a new faster-cutting "Taper" bit for drilling blast holes in very hard rock—are all illustrated, described and tabulated in a new 16-page bulletin No. 320. Write for it today if you can use it to advantage. No charge or obligation.

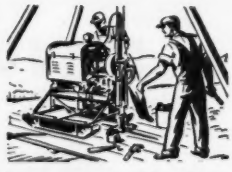


Drilling Machines and Accessory Equipment

To get the full benefit of our new diamond bits you need drilling machines with plenty of power and a wide range of both speed and feed. Model 40-C is our latest-model core-drilling machine and can be relied upon for best possible all-round results on holes up to 1000 feet in depth. Other modern machines provide for very deep core drilling and for either core drilling or blast-hole drilling underground. We also manufacture a complete line of improved accessory equipment. Illustrated bulletins containing detailed information mailed on request.

CONTRACT DRILLING

We do drilling by contract and are one of the oldest and largest contractors for any type of core drilling. Experienced crews are available at all times for service anywhere in the world. Estimates submitted promptly.



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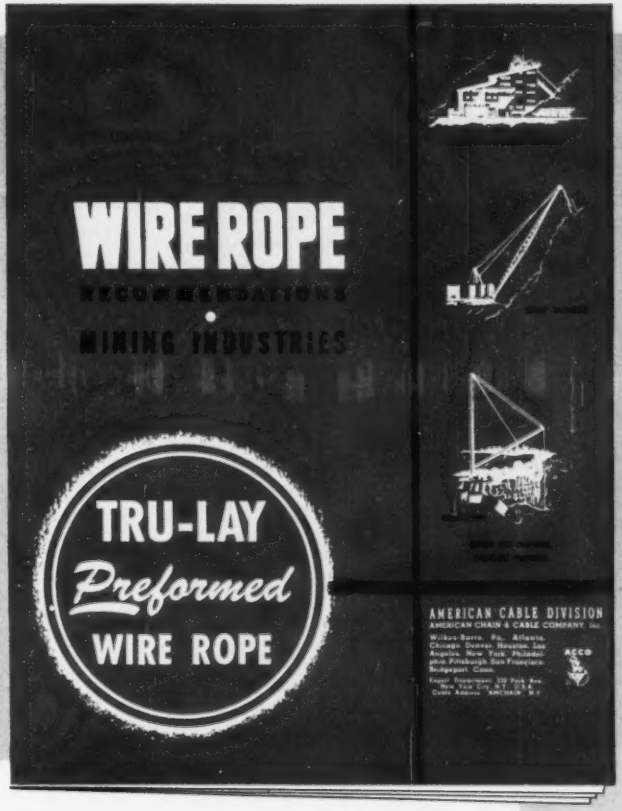
Here's a **NEW** Booklet that takes guesswork out of the selection of Mining Ropes



● With AMERICAN CABLE'S new wire rope recommendation booklet you see illustrations of various types of mining equipment. Then you look across the page at the listings, and there you find a complete description of the rope you need. Pages are 8½" x 11", the type is large and easy to read.

Here is the best wire rope recommendation book ever made for mining equipment. The recommendations are up-to-date and based on the successful use of TRU-LAY Preformed and other American Cable wire ropes over a long period of time.

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Please send DH-128-A "Wire Rope Recommendations for Mining Industries."

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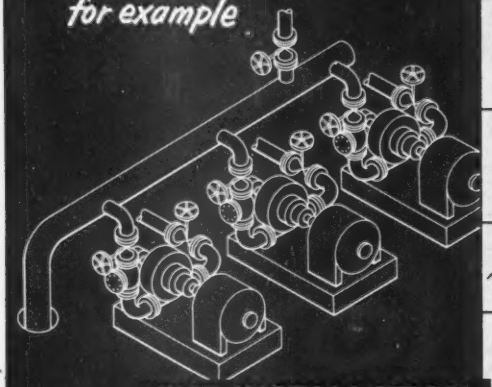
Can You Trust Your Checks to Hold Like This?

...on Water Pumps, for example



THE INSTALLATION

Crane Iron Body Swing Check Valves in 8-inch vertical lines on discharge side of water pumps supplying a large eastern paper mill.

VALVE SERVICE RATINGS

SUITABILITY:	Working smoothly - no complaints
FEATURES:	O.K. for either horizontal or upward flow
MAINTENANCE COST:	None - no maintenance needed to date
SERVICE LIFE:	Now better than other checks used
OPERATING RESULTS:	No water or head loss
PRICE:	In line with other makes
AVAILABILITY:	Stock item - Crane product

THE HISTORY

The mill depends on these pumps for all water. Loss of head at the pumps would create a serious problem. The mill could take no such risks. Regularly, the check valves on pumps were replaced, but only to be found leaking between pumping cycles, a few months later.

It's now more than a year since the change-over was made to Crane Check Valves. There's been no loss of water, no maintenance or replacement of any checks on the pumps. That was proof enough for the mill, that Crane Quality means better valves —greater dependability and bigger value. As a result, 3 more of these checks were installed on a separate battery of suction pumps.

THE VALVE

Crane No. 373, 125-Pound Iron Body Swing Check Valves, brass trimmed. The long life and high seating efficiency of these checks, in 2 to 8-in. sizes, is in large part due to the Crane patented flexible disc-hinge design. Double spring mounting eliminates lost motion between parts, yet permits true, full contact of disc and seat at every closure. Also serves to absorb the shock of seating under backflow pressure. See your Crane Catalog or Crane Representative for full details.

The Complete Crane Line Meets All Valve Needs. That's Why

More Crane Valves Are Used Than Any Other Make!

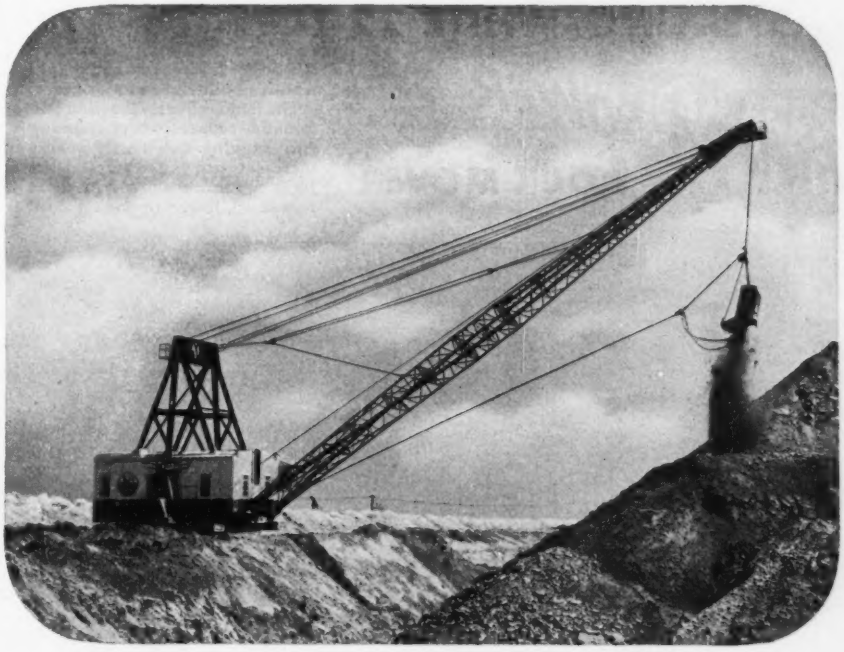
CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois

Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

WIRE ROPE



This is the most economical rope we've ever made for mining

ROEBLING is the best known name in wire rope. That's partly because we were the first wire rope maker in America. But more than that, we've always led in developing better wire and better rope for every purpose.

Today's Roebling Preformed "Blue Center" Steel Wire Rope is the miners' best choice for efficiency and long life. This rope has extra resistance to crushing and abrasion . . . takes rough going. It saves you time and cuts costs.

There's a Roebling wire rope for top service on any job. Call on your Roebling Field Man for his recommendations. John A. Roebling's Sons Company, Trenton 2, New Jersey.

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ATLANTA, 934 AVON AVE • BOSTON, 51 SLEEPER ST • CHICAGO, 5525 W. ROOSEVELT RD • CINCINNATI, 3253 FREDONIA AVE • CLEVELAND, 701 ST. CLAIR AVE, N. E. • DENVER, 4801 JACKSON ST • DETROIT, 915 FISHER BLDG • HOUSTON, 6216 NAVIGATION BLVD • LOS ANGELES, 5340 HARBOR ST • NEW YORK, 19 RECTOR ST • ODESSA, TEXAS, 1920 E. 2ND ST • PHILADELPHIA, 230 VINE ST • SAN FRANCISCO, 1740 17TH ST • SEATTLE, 900 1ST AVE S. • TULSA, 321 N. CHEYENNE ST • EXPORT SALES OFFICE, TRENTON 2, N. J.

Announcing the *NEW*

STERLING-WHITE 22-TON

PLAN-A-POWER ROCK MOVER

IT'S NEW! It's rugged and tough! And it's built right to *your* needs.

The famous Super-Traction Differential reduces wheel spinning and bogging down . . . greatly increases tire life. Every feature right for more work . . . more power . . . lower operating cost.

SEE IT at the
1952 MINING SHOW at DENVER

This great new Sterling-White 22-ton Plan-a-Power Rock Mover with Super-Traction Differential will be at Exhibit 1102 at the Denver Exposition. Don't miss it!

Engineered for the Exact Needs of the MINING INDUSTRY

• 22 ton payload, 15 cu. yd. capacity • 300 H.P. supercharged diesel engine • Ten-speed transmission, wide ratio range • Sterling-White Plan-a-Power rear axle. Single reduction carrier with final reduction in wheel hubs through tri-planet gears • Hydraulic power steering gear, short wheelbase, for outstanding maneuverability, ease of operation • Offset cab, extra wide, all-steel and rugged

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See Your Nearest STERLING-WHITE Representative

4 BIG PRODUCERS FOR YOUR MINE!

WHERE big production talks, the LaPlant-Choate line of Motor Scrapers and Motor Wagons fill the bill. Money-saving interchangeability keeps your machines working and earning, and reduces your equipment investment on every job. In either the 200 or 300 size, you can use your LPC Tractor with its matching LPC Scraper to grade and surface haul roads, build truck turn-arounds, level building sites, move spoil banks, strip overburden, or for any earthmoving job where high speed, big capacity and big power are needed. The same Tractor coupled to a matched LPC Wagon gives you a fast, big-production hauling unit.

See your LaPlant-Choate distributor today for details about these production twins . . . let him tell you how to move more material at still lower cost.

2 TS 200 MOTOR SCRAPERS Grade for Railroad to Paradise Mine for

MULLIGAN BROS., INC.

GREENVILLE, KENTUCKY

FOR a small but important job, building this railroad grade to Paradise Coal Mine was no cinch! Mulligan Bros.' two TS 200 Motor Scrapers moved 50,000 yds. of the toughest kind of material . . . a mixture of clay, rock and sand, filled with roots. Working a steady, productive 10-hour shift each day, the TS 200's hauled 10 pay yards each trip over poor haul roads. Average loading time was 45 seconds. Dumping the roots and rock was no problem because of positive forced ejection plus the extra high apron lift. This is a typical example of Motor Scraper performance and dependability on machine-killing jobs.

LaPLANT-CHOATE TS 200 MOTOR SCRAPERS AND TR 200 REAR DUMP ROCK WAGONS

THE TS 200 Motor Scraper is a 10 to 13 yd. hydraulically controlled earthmover for your smaller jobs, yet has all the speed, power and capacity for high production on long haul jobs. Speed . . . over 21 mph; positive double-acting hydraulic steering and hydraulic operation of bowl and ejector for direct, instantaneous control; your choice of a 176 HP Buda or a 165 HP Cummins diesel, are but a few of the outstanding TS 200 features.

The 18-ton TR 200 is a hydraulically controlled rear dump rock wagon which can be used interchangeably with the S 200 Scraper. It tilts 70° from the horizontal and its stable wheel base and 4-wheel brakes assure absolute safety when dumping over the edge of a fill. Rock lug tires, a protected cab and full hydraulic control are included among the many efficiency features.

FOR YOUR BIGGEST JOBS!

TS 300 MOTOR SCRAPERS AND TW 300 MOTOR WAGONS

WHEN you have a big earthmoving job, you can depend on the high production advantages of the fast, powerful TS 300 Motor Scraper. Big capacity . . . 14-cu. yds. struck and 18-cu. yds. heaped. Speeds in excess of 22 mph. Big power . . . with your choice of either a 280 HP Buda or a 275 HP Cummins diesel.

The TW 300 is a hydraulically controlled bottom dump wagon which can be interchanged with the S 300 Scraper. 14- to 19-cu. yd. capacity, big 24:00 x 29 24-ply tires to carry heavy loads, double-acting hydraulic steering and hydraulic door control for effortless, trouble-free operation, large 4-wheel air brakes and many other money-saving features make this wagon outstanding in its field.

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MANUFACTURING CO., INC. CEDAR RAPIDS, IOWA, U. S. A.

one solid source...

HANGERS
Timber, combination and roof types

ROOF BOLTING UNITS
Engineered especially for roof bolting

LOCKTITE CLAMPS
For all shapes and sizes of trolley wire

HARPS, SLIDERS
Slider is supported at contact level for both high and low wire

COMBINATION CABLE & TROLLEY CLAMPS
Trolley wire and feeder (up to 1,500,000 C.M.) may be adjusted independently

SECTION INSULATORS WITH SWITCH

For all sizes of trolley and feeder wire. Available with either quick-break or slow-break switch.

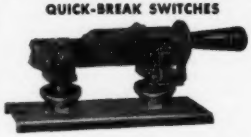
INSULATED J-HOOKS
Hang anything in the mine on this and other shapes of J-hooks

FUSED TROLLEY TAPS

Take two bites on cable, reduce pull-outs to a minimum

"NO-LOSS" EXPANSION BOLTS
Both 4" and 6" cases, ⅝" bolts in various styles

QUICK-BREAK SWITCHES



100 amp to 2500 amp with or without enclosing box

..and the exclusive Elreco Inverted Trolley System that eliminates trolley poles and nips...makes motor operation *safe*...cuts maintenance 90%!

Depend on this complete line of trolley material for every type of mine operation. Every product in the line is the best we know how to make. You'll want our new catalog. Write me personally for one.

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A COMPLETE LINE OF TROLLEY MATERIAL FOR EVERY MINE

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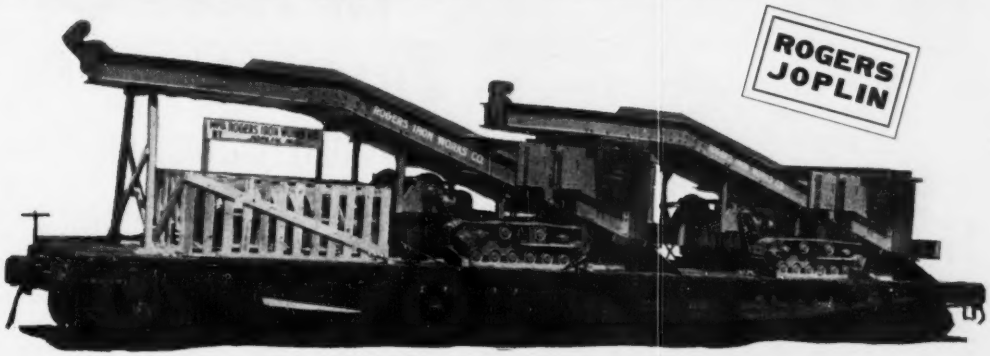
Rogers loaders for CANADIAN EXPLORATION COMPANY



Two Rogers loaders recently shipped to the Canadian Exploration Company at Salmo, British Columbia.

ROGERS UNDERGROUND LOADERS

- Crawler Mounted Mobility
- Air or Electric Driven
- Dual Drive Motors
- Choice of Slusher Hoist
- High Tonnage on Long Hauls
- Extremely Low Maintenance
- Discharge at Any Truck Height
- Continuous, Reliable Operation

ROGERS SLUSHER LOADERS, built in a range of sizes for use with 30 to 72 inch scrapers, move ore load ore fast. Maximum reach is limited only by the cable capacity of the slusher hoist which is installed as an integral part of the loaders. Discharge point can be quiet to load into any height truck or mine car. Mobility permits quick withdrawal and return to the stope after blasting. Continuous, reliable operation from centralized controls by one man in a comfortable working position. The ROGERS SLUSHER LOADER is built to last for years of low cost, trouble free, high tonnage operation.

OTHER ROGERS EQUIPMENT:

- Apron Feeders
- Reciprocating Feeders
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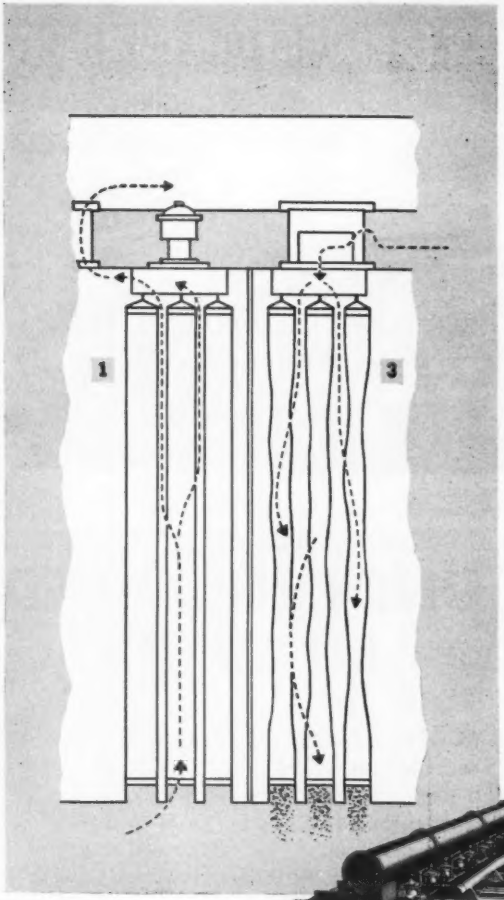
- Drill Jumbos
- Portable Crushing Plants
- Mine Hoists
- Rock and Ore Washers
- Revolving Screens
- Vibrating Screens
- Live Roll Grizzlys
- Elevators

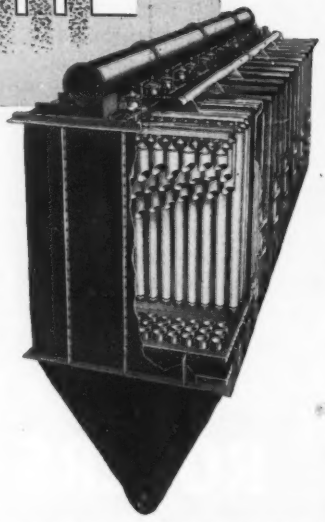
ROGERS
IRON WORKS COMPANY
Joplin, Missouri



How Norblo gives you 24-hour-a-day dust collection at full rated capacity

Fast double-action bag cleaning assures full efficiency and constant suction drop across the arrester

No matter what the task in large scale continuous operation, Norblo equipment stands the gaff — with low maintenance and economical over-all cost. Norblo Automatic Bag Type Dust Collectors have been completely reliable in all types of installations for over 25 years, proving the soundness of the operating principles described below:



1 Basic unit compartment houses 78 cylindrical bags — fully distended by upward inside air flow.

2 Variable timing of cleaning cycle, easily adjusted according to dust load, insures constant volume of air handled and constant static pressure drop across the arrester.

3 Bag cleaning involves only one compartment at a time, and only a few seconds out of each hour of operation. During cleaning period bags are shaken and air flow is reversed, loosening dust and accelerating its descent into the hopper. *This double-action bag cleaning insures utmost efficiency of the equipment and in no way interrupts the suction drop.*

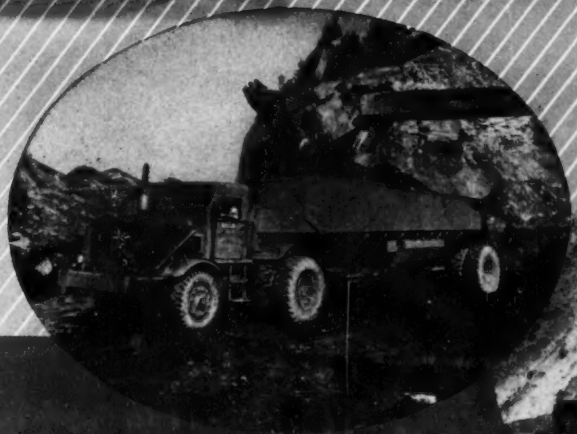
4 Any compartment may be cut out of operation for bag replacement or repair, all other compartments remaining in operation.

Norblo Equipment is completely designed and fabricated in our own shops and sold on the basis of *guaranteed performance.* Let us send you Bulletin 164-3.

THE NORTHERN BLOWER COMPANY

Engineered Dust Collection Systems for All Industries

6410 Barberton Ave. • Cleveland 2, Ohio



In Mines and Quarries "EUCS"

HAUL MORE TONS AT LESS COST

Hope to see you at the Denver Mining Show... Be sure to visit space 901 and our big outdoor exhibit at the main entrance.

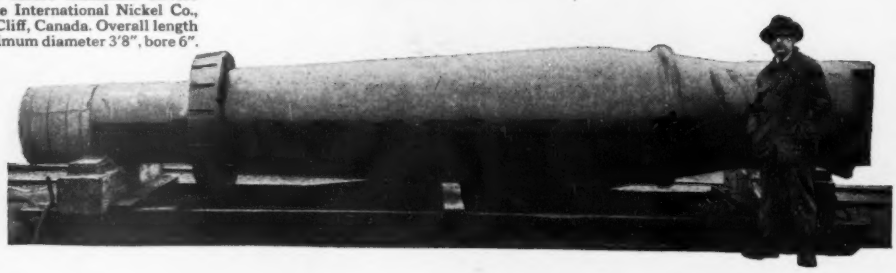
Built for tough off-the-highway hauling, Rear-Dump and Bottom-Dump "Eucs" have stepped up production and cut hauling costs on hundreds of open pit mining and quarry operations.

Euclids have proved their efficiency and long life in hauling a wide variety of materials . . . coal, ore, rock, overburden and other heavy excavation. Bottom-Dumps are powered by diesel engines of 190 to 300 h.p. . . . loaded speeds up to 34.4 m.p.h. . . . available in 20 to 40-ton capacities. Rear-Dump "Eucs" have travel speeds up to 36.3 m.p.h. . . . powered by diesel engines of 125 to 400 h.p. . . . range in capacity from 10 to 34 tons.

Your Euclid Distributor has performance data on jobs similar to yours. Ask him for a Euclid hauling cost estimate — there's no cost or obligation.

The EUCLID ROAD MACHINERY Co. • CLEVELAND 17, OHIO

EUCLIDS



GIANT NICKEL STEEL SHAFT... installed as a replacement on a 54" crusher, to assure maximum service life for The International Nickel Co., at Copper Cliff, Canada. Overall length 21'6", maximum diameter 3'8", bore 6".

How Nickel Helps a Crusher

PUT THE SQUEEZE ON COSTS

Many forgings are so large that only part of the mass can be worked under the press before the steel has to be reheated. These large sections of steel, typified by this crusher shaft, so limit the cooling rate as to make liquid quenching ineffective.

Consequently, improved strength, hardness and other properties that prolong life of large forgings are much more dependent upon wise selection of alloy content than is the case with small forgings.

Because of these facts, the large crusher shaft shown above was forged from a 160,000-pound ingot of 2¾ per cent nickel steel... produced, rough-turned and heat-treated by the Bethlehem Steel Company, and finish-machined by the Traylor Engineering Company of Allentown, Pa.

After normalizing and tempering, two tests on longitudinal specimens, taken from a prolongation at mid-radius, averaged as follows:

Tensile Strength	80,000 p.s.i.
Yield Strength	51,000 p.s.i.
Elong. in 2"	28.0%
Red. of Area	58.3%

The strengthening effect of nickel on ferrite is independent of carbon content or heat treatment of the steel, and its effectiveness in reducing the rate and temperature of the upper transformation, induces better response to the necessarily milder heat treatments used.

Nickel alloy steels may help you obtain peak performance from vital parts of *your* products or equipment. Send us the details of your problems for our suggestions. Write us now.

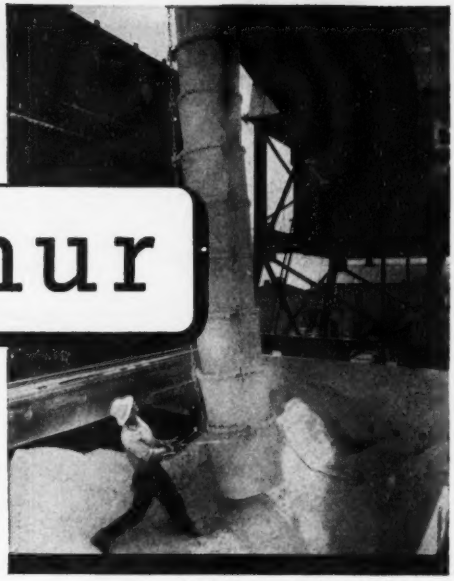
At present, most of the nickel produced is being diverted to defense. Through application to the appropriate authorities, nickel is obtainable for the production of engineering alloy steels for many end uses in defense and defense supporting industries.

EMBLEM OF INCO SERVICE

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

MT. VERNON EXTRA
UNIFORMITY
Makes the
Big Difference
in FILTER
Fabrics
Mt. Vernon - Woodberry Mills
TURNER HALSEY
COMPANY
40 WORTH ST. NEW YORK

Sulphur

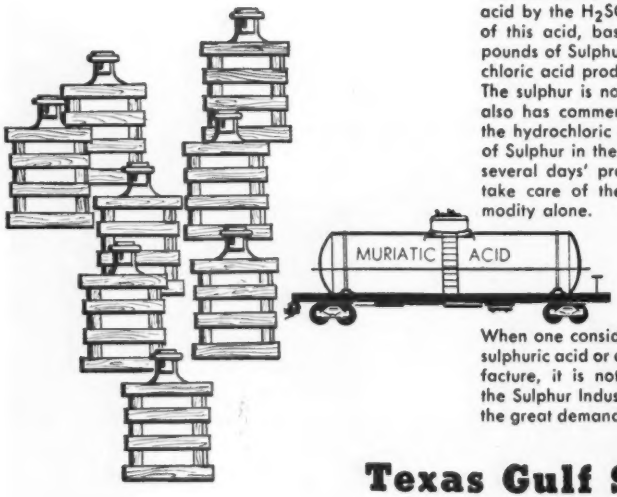


Loading a ship with Sulphur at Galveston

Thousands of tons mined daily, but where does it all go?

PARAPHRASING an old saying: 'It takes a chemical to make a chemical,' certainly applies to hydrochloric acid.

No chemical engineer has to be told how hydrochloric acid is made but sometimes with the mind focussed on the word "hydrochloric" little thought is given to another word "sulphuric." It is this word that calls attention to the fact that to make one net ton of 20° Bé hydrochloric acid by the H_2SO_4 process requires about 950 pounds of this acid, basis 100%, which is equivalent to 320 pounds of Sulphur. About one third of the annual hydrochloric acid production is made by the use of sulphuric. The sulphur is not lost because salt cake, a by-product, also has commercial value. But any way you figure it, the hydrochloric acid industry is an important consumer of Sulphur in the form of sulphuric acid. In fact, it takes several days' production from all the Sulphur mines to take care of the annual production of this one commodity alone.



When one considers all the other chemicals that require sulphuric acid or other Sulphur compounds for their manufacture, it is not difficult to appreciate how faithfully the Sulphur Industry is serving industry today in spite of the great demands made upon it.

Texas Gulf Sulphur Co.

75 East 45th Street, New York 17, N. Y.

Mines: Newgulf and Moss Bluff, Texas

TOP JOB TEAM....

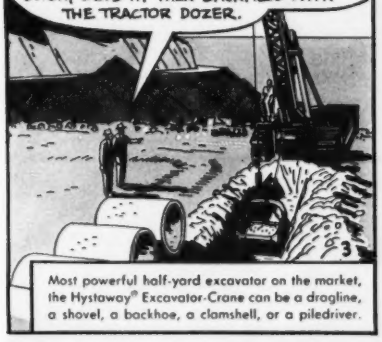
HYSTER *Tractor Tools and* CATERPILLAR *Diesel Tractors*

Every Caterpillar-Hyster dealer can tell you about Hyster tractor equipment...how it works with Caterpillar-built tractors...how this job team has been working together for almost a quarter of a century—he will give you a 16-page cartoon book illustrating the many uses for Hyster Tractor Tools.

HYSTER® TRACTOR TOOLS IN ACTION

HERE ARE FOUR OF MANY WAYS HYSTER TOOLS TEAM WITH CATERPILLAR TRACK-TYPE TRACTORS TO SPEED PRODUCTION AND CUT COSTS FOR ALL TYPES OF CONTRACTORS.

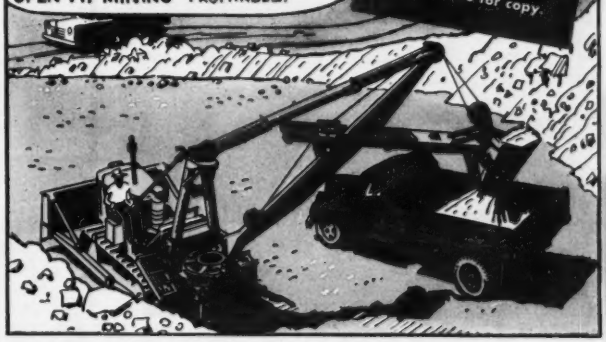
AN ALL-AROUND TOOL FOR DRAINAGE WORK THE HYSTAWAY DRAGLINE NOT ONLY EXCAVATES THE TRENCH, BUT WITH FULL TRACTOR-TYPE OSCILLATION ALSO WALKS CULVERT TO THE DITCH, SETS IT, THEN BACKFILLS WITH THE TRACTOR DOZER.



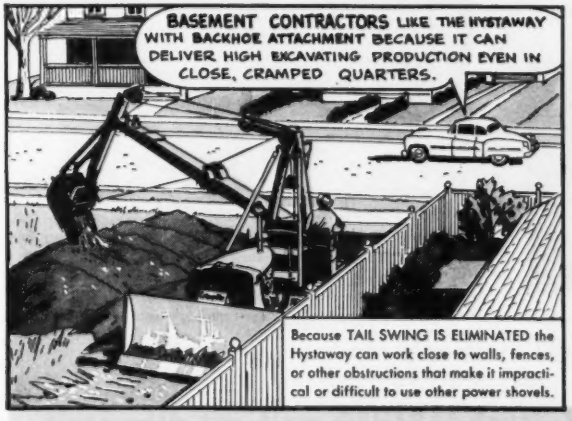
Most powerful half-yard excavator on the market, the Hystaway® Excavator-Crane can be a dragline, a shovel, a backhoe, a clamshell, or a piledriver.

FAST SWING, HEAVY-DUTY DIESEL TRACTOR ENGINE POWER PAYS DIVIDENDS IN THE MINING INDUSTRY WHERE THE HYSTAWAY SHOVEL IS MAKING SMALL OPEN-PIT MINING PROFITABLE.

Tractor tool applications shown here are from Hyster's new 16-page cartoon book, "A Story of Tractor Tools and Their Uses". Write for copy.

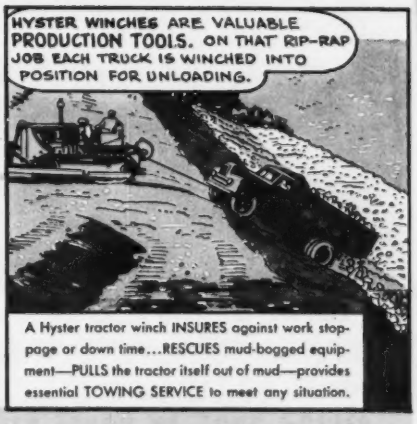


BASEMENT CONTRACTORS LIKE THE HYSTAWAY WITH BACKHOE ATTACHMENT BECAUSE IT CAN DELIVER HIGH EXCAVATING PRODUCTION EVEN IN CLOSE, CRAMPED QUARTERS.



Because TAIL SWING IS ELIMINATED the Hystaway can work close to walls, fences, or other obstructions that make it impractical or difficult to use other power shovels.

HYSTER WINCHES ARE VALUABLE PRODUCTION TOOLS. ON THAT RIP-RAP JOB EACH TRUCK IS WINCHED INTO POSITION FOR UNLOADING.



A Hyster tractor winch INSURES against work stoppage or down time...RESCUES mud-bogged equipment—PULLS the tractor itself out of mud—provides essential TOWING SERVICE to meet any situation.

Hyster manufactures an extensive line of tractor-mounted and tractor-drawn equipment for contractors—included are Winches, 2 and 3-Drum Hoists, Grid Roller and the Hystaway Excavator-Crane (half-yard Shovel, Backhoe, Dragline, Clamshell, Crane, Pile Driver). Hyster Tractor Tools are sold and serviced by more than 700 Caterpillar-Hyster dealer stores. For complete information, consult your dealer or write for literature.

HYSTER COMPANY

2965 N. E. CLACKAMAS ST...PORTLAND 8, OREGON
1865 NORTH ADAMS STREET....PEORIA 1, ILLINOIS

LINATEX now available in the UNITED STATES

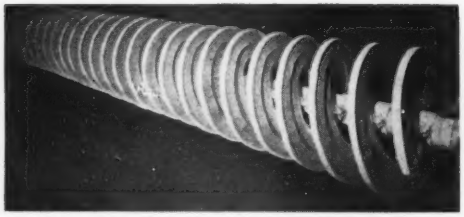
...LINATEX reduces maintenance costs and gives longer life performance

LINATEX is a special form of rubber manufactured in Malaya. A patented process preserves the crystal structure and imparts special qualities that can only be found in LINATEX.

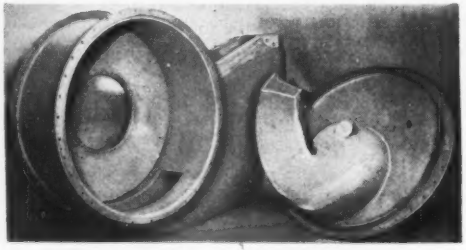
LINATEX will withstand destructive usage such as it may be subjected to on conveyor belts, pumps, pipes, cones, chutes and other equipment handling fast-moving coal, rock or ore masses — and all kinds of abrasive material. LINATEX is outstanding where abrasion problems exist.

The unusual properties of LINATEX make possible a wide range of applications in maintenance work because:

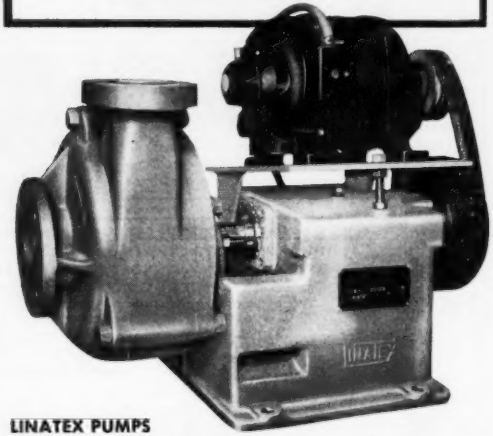
1. Will withstand any climatic conditions.
2. Can be joined by air-cured cements in the field.
3. Will not harden at low temperatures.
4. Is 3 to 4 times more resilient than conventional rubbers.
5. Is non-absorbent.
6. Has greater resilience to abrasion than any metal.
7. Light in weight — has a Sp. Gr. of .97.



AKINS CLASSIFIER — Spiral is completely covered with LINATEX. This classifier is subject to very acid conditions — with Linatex, "eating out" is eliminated.



BALL AND ROD MILL FEED SCOOP — Scoop is completely lined with LINATEX. No visible wear after four years of service. All scoops at these mines are now LINATEXED.



LINATEX PUMPS

Sizes 1" to 12" are available for mine use—many of these are now in operation in mines all over the world.

An outstanding advantage of Linatex is the fact that a worn part can easily be repaired by cementing new LINATEX over worn surface. No specially trained men are necessary to fabricate LINATEX — your own workmen can apply LINATEX to any equipment.

If you have abrasion or corrosion problems, write for further information and data today.

LINATEX® CORPORATION OF AMERICA
Rockville, Connecticut

Associated with:
WILKINSON LINATEX CO., LTD., CANADA

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ENGLAND, SOUTH AFRICA, AUSTRALIA, INDIA, MALAYA

Up steep hills—on loose gravel and sand piles
over sharp rocks—slush, mud, gravel—out and over
the highway **GENERALS** deliver more loads

Faster! Easier! At Lower Cost!

GENERAL L. C. M.—for most work off-the-road. Massive tread and thick, tough shoulders develop extra traction. Extra wear on tough, jagged surfaces. Stronger rayon cord body with more natural rubber built into its shock-absorber design.

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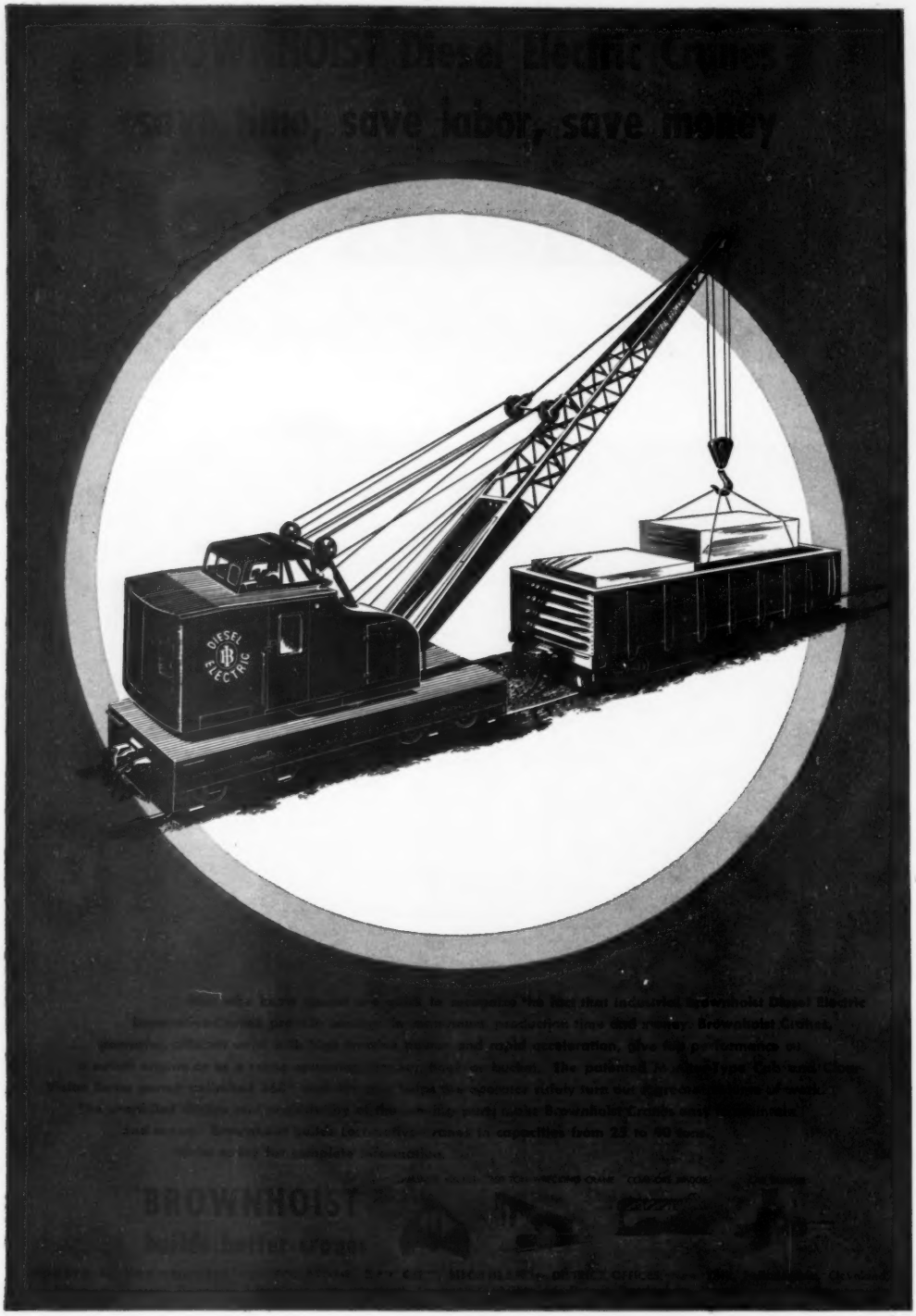
Your GENERAL TIRE DEALER will KRAFT SYSTEM RECAP Worn Tires with the New GENERAL Truck Tire Tread of Your Choice

You're throwing away money when you throw away worn tires or accept an ordinary "adjustment" for them. Let your General Tire Dealer—a tire expert—restore worn tires with famous factory controlled Kraft System Recapping. You choose from the complete line of on and off-the-road new General Tire treads and he'll put that tread on your worn tire. He can do sectional repairs too. Get Kraft System Recapping—get more profit from every tire.

KRAFT SYSTEM RECAPPING
A GENERAL TIRE SERVICE

SPECIFY GENERAL TIRES ON YOUR NEW EQUIPMENT


DIESEL
ELECTRIC

Simplify mine and tunnel ventilation

Here's the airduct that can take it! Now you can deliver air to the working face of mine or tunnel — cheaper! That's because SPIRATUBE-M is built to cut maintenance costs! Ease of handling reduces installation costs. Unique SPIRATUBE-M construction features minimize leaks and seepage. And you get the maximum efficiency of your blower or fan . . . cutting power costs!

Immediately available in diameters to 30 inches, from fully-stocked distributors, SPIRATUBE-M is made in tough high count fabrics, all specially treated and heavily coated inside and out to withstand fungus, mildew and rough treatment.

And, patented, *built-in*, quick-couplers eliminate the need for separate parts . . . no need to look for couplers when you're in a hurry.

For heavy duty, pressure ventilation tubing without wire reinforcement, ask for AYRTUBE®. Sold in diameters to 36", AYRTUBE by itself or in combination with SPIRATUBE-M offers you an inexpensive airducting.

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Lightweight

Flexible

Easily installed by you

Takes sharp turns without crimping

Withstands fungus, mildew, rough treatment

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Cut drilling costs with THROWAWAY Bits...

Save Steel
Save Powder

1 Easily deformable skirt permits quick removal of bit from shank. No lost time with stuck bits.

2 Ample chip clearance allows faster drilling.

3 Short reaming sides eliminate sticking and allow close gauge following.

4 Blunt non-breaking cutting edges have self-sharpening tendency . . . are uniformly tempered hard, biting steel.

5 Large hemispherical non-plugging water outlet.

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7 Perfect uniformly treated bit teeth assure best possible cutting power and smooth operation.

LOWER your drilling costs with smaller holes and faster drilling. Bottom with 1¼ inch holes and save costly steel and powder. Let us prove to you that the man at the drill can do more work for less cost with a Throwaway Bit. Write for new low price list and technical description of Throwaway Bit to: Portland, Oregon home office or distributors listed below. Competent field engineers and dealers are always at your service.

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In the range from 1 to 400 horsepower JONES offers the most complete line of Herringbone Gear Speed Reducers available *ANYWHERE*.

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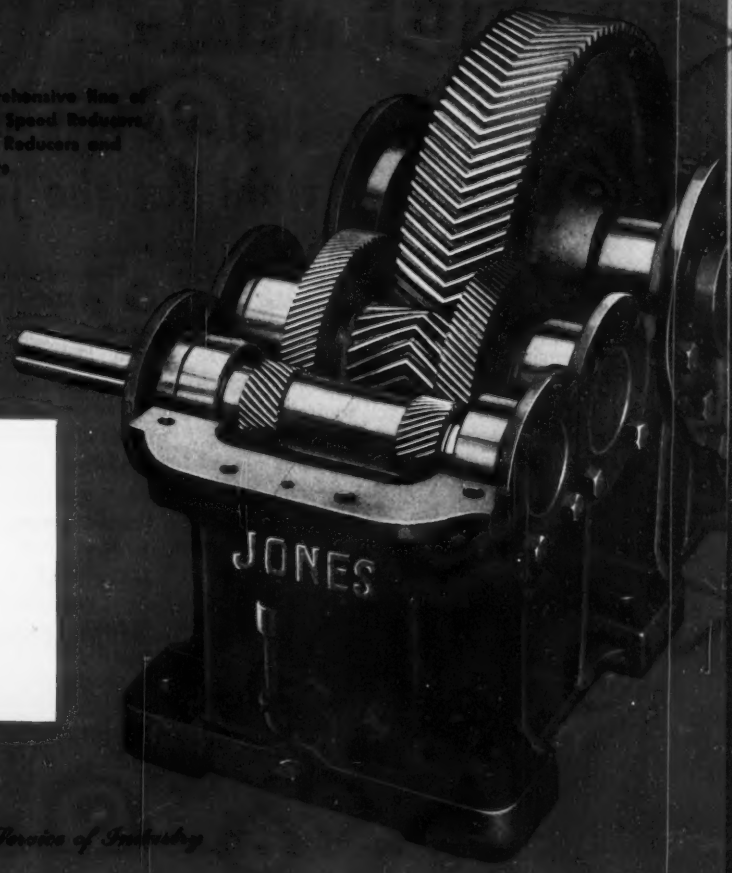
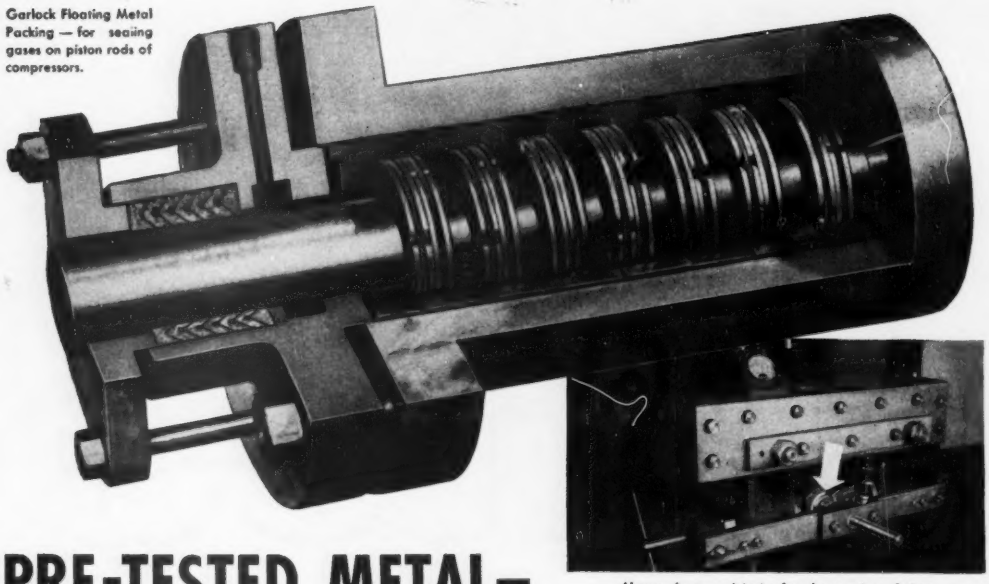


Power ASSIST . . . In the Service of Industry

W. A. JONES FOUNDRY & MACHINE COMPANY, 4413 Roosevelt Road, Chicago 24, Illinois

Garlock Floating Metal Packing — for sealing gases on piston rods of compressors.



PRE-TESTED METAL—

Above: Arrow points to foundry specimen being wear-tested on specially designed machine.

Your assurance that Garlock Metal Packings are right for the job!

Designed specifically for high pressure and high temperature service to seal air, ammonia, steam or any gas on piston rods of compressors and steam engines, Garlock Metal Packings are quality-controlled throughout their entire manufacture.

Starting with the metals of construction, every "heat" of cast iron and bronze is accelerated-wear-tested on a special machine by an independent organization before the materials are shipped to Garlock. If the wear test specimen does not pass Garlock's rigid standards, then the entire "heat" is rejected.

Then, using these tested, high-grade materials, Garlock Metal Packings are accurately machined to exacting specifications by experienced craftsmen. Throughout every operation extreme precision is the watch-word.

The product of this rigid pre-testing and precision manufacture is a metal packing that you can be sure will meet your service requirements. So, standardize on Garlock Metal Packings—they last longer, require less maintenance.

THE GARLOCK PACKING COMPANY
PALMYRA, NEW YORK
In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.

GARLOCK FLOATING METAL PACKINGS

Acceptance

Wherever you are, there's a MARION working near you —a MARION dragline, clamshell, crane, pull shovel, pile driver or walking dragline. The *worldwide acceptance* MARION machines have won over a period of 68 years is one of the best recommendations we have.

Their selection for such impressive assignments as the Boulder Dam, Panama Canal, TVA dams, and other big projects in construction, mining, quarrying and coal stripping endorses MARION as a name you can trust.

MARION has many "firsts" in the development and refinement of excavators and material handling machines. MARION offers more types and sizes of machines than any other manufacturer.

Look to MARION for resourceful, conscientious help in solving your excavating and material handling problems.

Write today for a copy of Bulletin 403-A—*it pictures and describes in condensed specifications every machine in the world's most complete line of excavating and material handling machines.*

MARION POWER SHOVEL CO.
MARION, OHIO, U. S. A.

OFFICES AND WAREHOUSES IN ALL PRINCIPAL CITIES

"Carlon costs less!"

"We've really saved on piping costs since we started using CARLON. It's much lighter and easier to handle than heavy metal pipe . . . requires fewer fittings . . . makes-up faster . . . and lasts many times longer with no maintenance. What's more, we don't pay a premium price for these money-saving features!"

CARLON plastic pipe gives you superior quality at low cost. For your protection, every foot is factory-tested for more than 8 hours at higher-than-working pressures. In addition, it is guaranteed against rot, rust and electrolytic corrosion and won't accumulate scale or sediment.

CARLON — the first real pipe that is plastic — has proven to be the answer to mine piping problems because it cuts installation and maintenance costs to absolute minimum.

NOM. SIZE	O.D.	I.D.	EST. BURST P.S.I.	WT. LBS. PER FT.	SHPG. LENGTHS
½"	0.840	0.622	540	0.103	400 ft. coils
¾"	1.050	0.824	350	0.140	400 ft. coils
1"	1.310	1.070	200	0.181	300 ft. coils
1¼"	1.660	1.380	200	0.267	300 ft. coils
1½"	1.900	1.610	200	0.320	250 ft. coils
2"	2.378	2.070	170	0.445	200 ft. coils
2½"	2.875	2.469	170	0.680	200 ft. coils
3"	3.504	3.070	165	0.910	100 ft. coils
4"	4.504	4.030	150	1.250	25 ft. str.
6"	6.630	6.070	115	2.230	25 ft. str.

CARLON CP 806-CP

Specify the Pipe with the Stripe!

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CARLON PRODUCTS CORPORATION

Pioneers in Plastic Pipe

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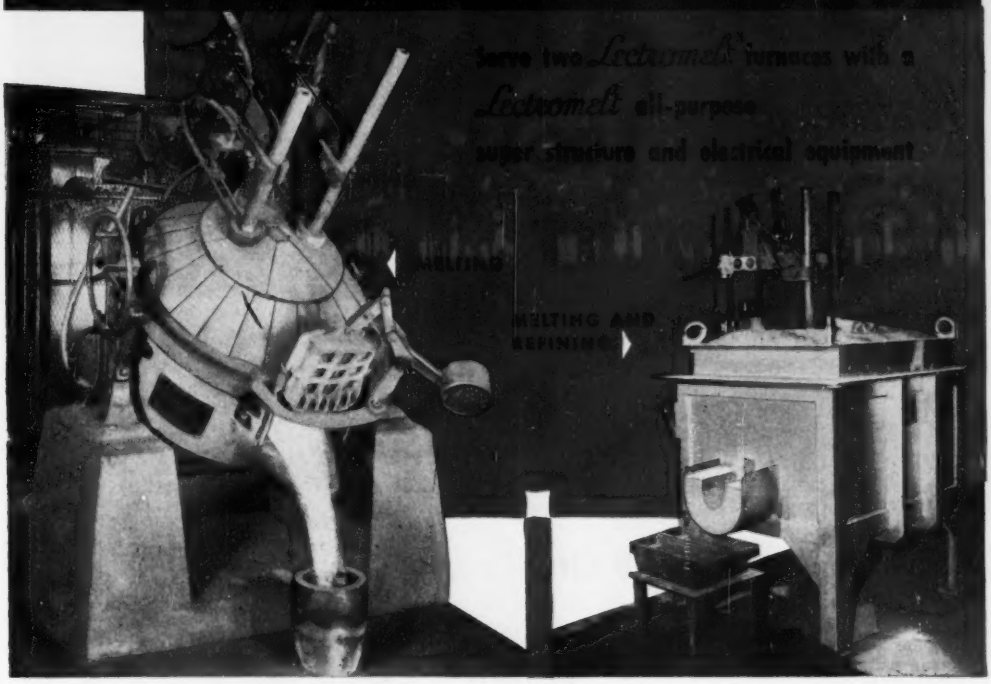
Save money in outfitting your laboratory



With these two furnace shells and the one Lectromelt superstructure, your laboratory can handle almost any problem having to do with electric furnace operations. The superstructure can be shifted from one furnace to the other, as required, along with its electrical equipment.

The combination at the left is designed for small scale, batch smelting of ores and concentrates, melting of non-metallics, melting and refining of metallics. The furnace at the right can be used for continuous operations in experimenting on the reduction of ores and melting of non-metallics.

Both furnaces can be employed with direct and indirect arcs. 50 KVA of power is available on low voltages and 100 KVA on high voltages.

Lectromelt engineers have been conducting continuing research for many years on electrothermic reductions, so they can help you put these laboratory furnaces to work proving new processes or improving the old ones. For Catalog No. 104 telling you about this service, write Pittsburgh Lectromelt Furnace Corp., 322 32nd Street, Pittsburgh 30, Pa.

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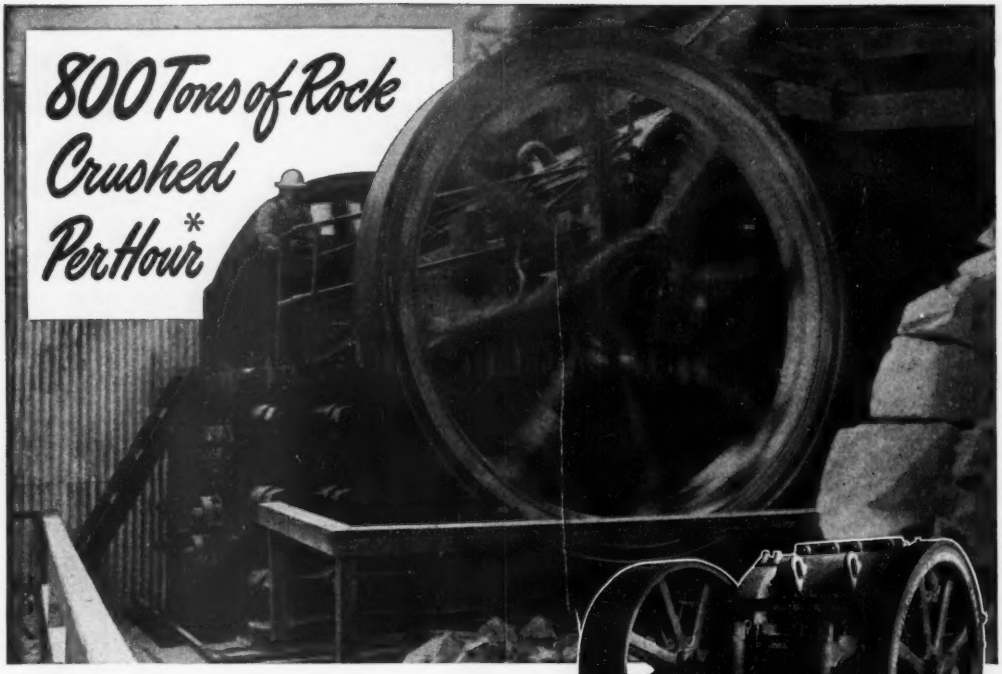
MOORE RAPID

WHEN YOU MELT... *Lectromelt*



✳..at Detroit Dam, Mill City, Ore.
by the

LARGEST DEEP FRAME CRUSHER EVER BUILT

This all-steel, primary crusher, size 66" x 84", digests 8 cu. yds. of hard rock at one gulp. It takes the complete load directly from the dump trucks without the use of a feeder. Set for 10½" discharge, this unit crushes 800 tons per hour.

That's the kind of performance you can expect from BIRDSBORO-BUCHANAN jaw crushers, regardless of size. Power, strength, high capacity and long life are built into every crusher to give dependable, continuous, low cost service. For help in planning your crushing requirements, it will pay you well to call on BIRDSBORO-BUCHANAN engineers.

PATENTED OFFSET TOE LUGS THAT NEVER WEAR OFF

installed on swing jaw and front head to double the life of jaw plates and cut maintenance costs in half.

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STEEL FOUNDRY & MACHINE CO.
Birdsboro, Penna.

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Concord #20 Steam Hose

FLEXIBLE

Tough

Dependable

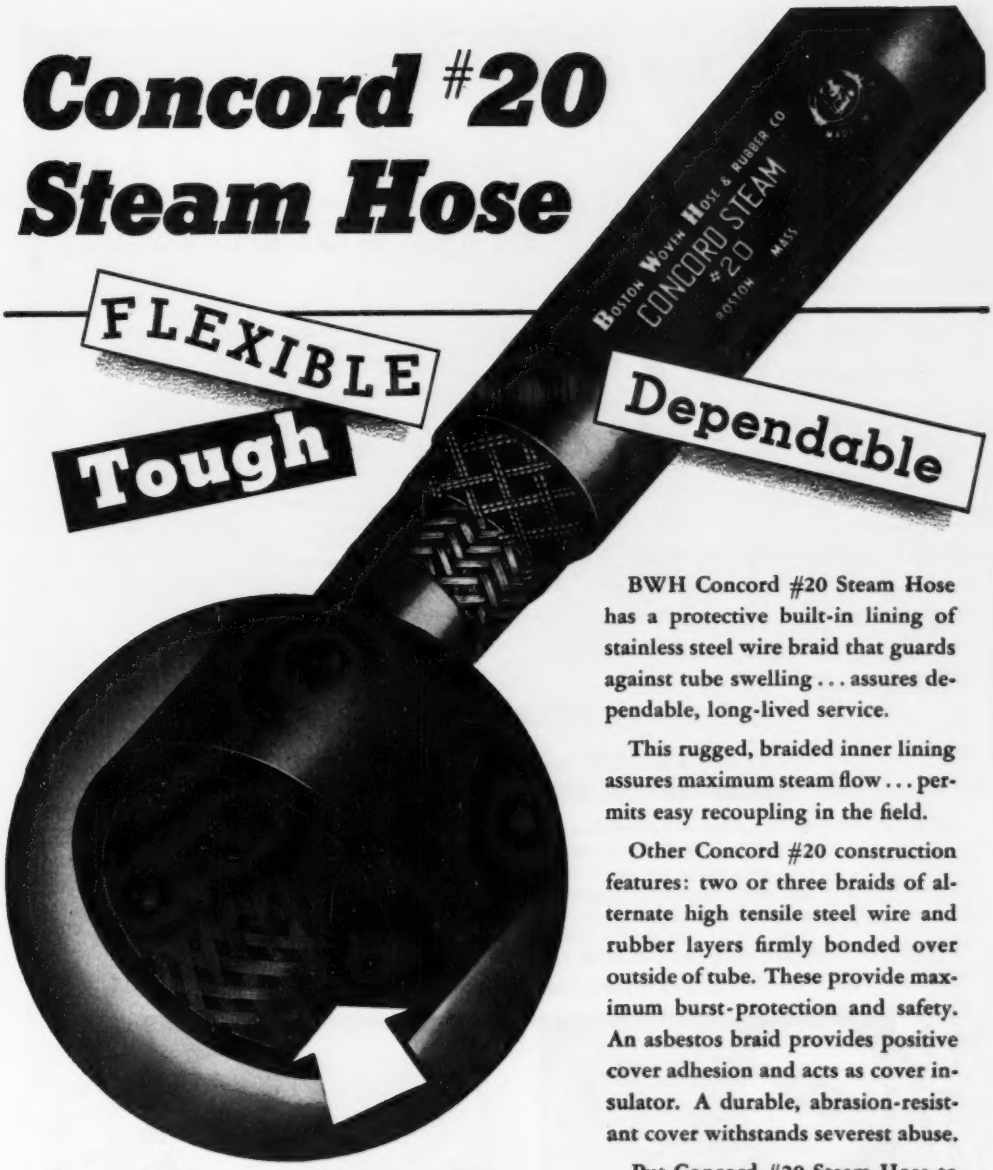


Illustration shows how special built-in lining of stainless steel inner wire braid assures long life under the most severe operating conditions.
Pat. applied for

BWH Concord #20 Steam Hose has a protective built-in lining of stainless steel wire braid that guards against tube swelling . . . assures dependable, long-lived service.

This rugged, braided inner lining assures maximum steam flow . . . permits easy recoupling in the field.

Other Concord #20 construction features: two or three braids of alternate high tensile steel wire and rubber layers firmly bonded over outside of tube. These provide maximum burst-protection and safety. An asbestos braid provides positive cover adhesion and acts as cover insulator. A durable, abrasion-resistant cover withstands severest abuse.

Put Concord #20 Steam Hose to work for *you — now!*

Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Distributors in all Principal Cities

PLANT: CAMBRIDGE, MASS. • P. O. BOX 1071, BOSTON 3, MASS., U. S. A.

BWH
DEPENDABLE RUGGEDNESS

NOW! THE TOUGHEST SHOT FIRING CABLE EVER PRODUCED!

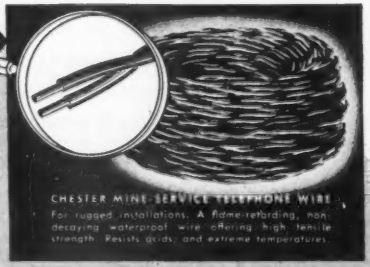
Check the long life qualities offered by this *SUPER DURABLE* **SHOT FIRING CABLE**

- RESISTS SHARP EDGES AND ABRASION
- FLAME RETARDING AND WATERPROOF
- NON-DECAYING AND NON-AGING
- HIGH STRENGTH AND FLEXIBILITY
- NON-CRACKING FROM −40°C to +80°C
- RESISTS MOST ALKALIS, ACIDS, OILS, GREASES
- IMMUNE TO OZONE AND SUNLIGHT

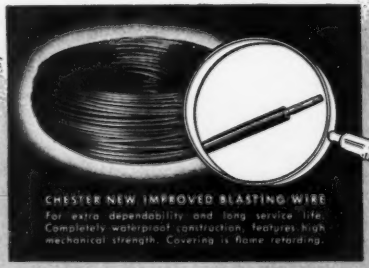
Exclusive CHESTER nylon jacket over center core increases service life and promotes mine safety

Here's the shot firing cable you can depend on for really tough mine service. It's highly durable when exposed to sunlight and ozone, withstands dragging over sharp edges and abrasives and is highly flexible. Non-cracking over a wide temperature range, Chester is flame retarding and waterproof—the kind of cable that's good for years of usefulness in all types of mining operations. Ask for Chester the next time you order — you'll agree, IT'S THE TOUGHEST SHOT FIRING CABLE EVER MADE!

Call or write for complete data and samples



CHESTER MINE SERVICE TELEPHONE WIRE
For rugged installations. A flame-retarding, non-decaying waterproof wire offering high tensile strength. Resists acids, and extreme temperatures.

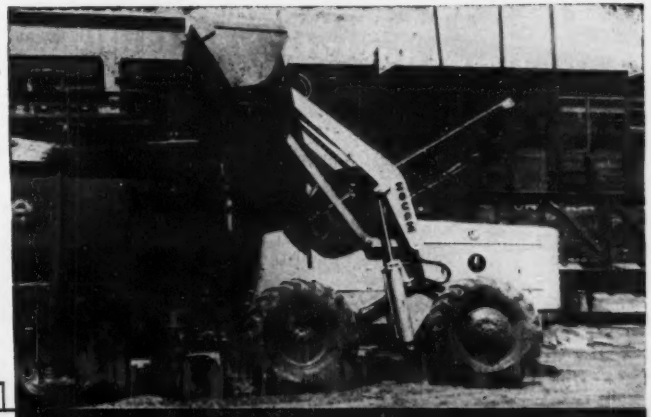


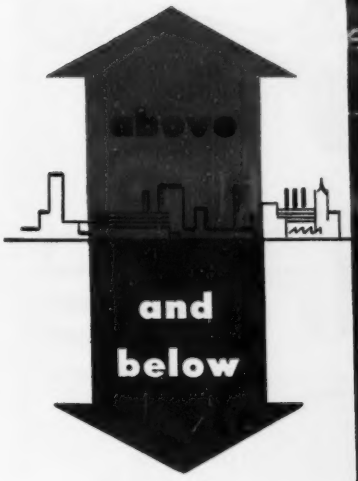
CHESTER NEW IMPROVED BLASTING WIRE
For extra dependability and long service life. Completely waterproof construction, features high mechanical strength. Covering is flame retarding.

CHESTER CABLE CORP.
CHESTER, NEW YORK

MANUFACTURERS OF QUALITY WIRES AND CABLES FOR EVERY INDUSTRIAL AND COMMERCIAL APPLICATION

Loads gondolas, spots cars . . . does many jobs at smelter.





PAYLOADERS boost production

Boosts production, cuts costs, improves operations in lead-zinc mine.

The need for more metal production finds the big four-wheel-drive "PAYLOADER" tractor-shovel quickening the pace underground, in open pits and on the surface. Its unusual tractive ability under all ground conditions, four speeds in each direction and great versatility have helped step up production and slice costs at many properties . . . its ability to load, strip, spread, stockpile, carry, lift, push and pull keeps it profitably busy wherever it is put to work.

The underground operation shown is at Bilharz Mining Co., Inc. in the Tri-State area where the "PAYLOADER" has tremendously improved operations in terms of production, costs and flexibility. It will also pay you to investigate the merits of this big 1½ cu. yd. tractor-shovel and the six other sizes of the "PAYLOADER" line. "PAYLOADER" Distributors are located in all strategic areas and are equipped to render complete service. The Frank G. Hough Co., 726 Sunnyside Ave., Libertyville, Illinois.

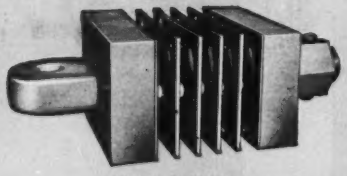
Write for catalog and full details about the 1-1/2-yd. 4-wheel drive "PAYLOADER" or six smaller "PAYLOADER" models down to 12 cu. ft.

In transportation...

Willison Automatic Couplers

National NC-1 Truck

National M-225 Rubber-Cushioned Draft Gear

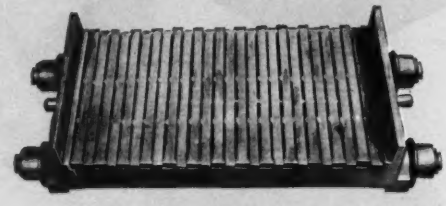


National M-230 Rubber-Cushioned Draft Gear

Naco Steel Swivel Hitching and Link

In processing...

Ore-Grinding Balls



Cast Steel Pallet and Mallix Sintering Bars

NATIONAL equipment cuts per-ton costs

Decades of experience combined with resourceful and advanced engineering have placed NATIONAL in the forefront as a producer of mine and industrial equipment for increasing safety at reduced per-ton cost.

New National NC-1 Trucks provide a smoother ride that results in less wear on cars . . . reduces impact on roadbed . . . minimizes spillage. Willison Automatic Couplers give maximum safety . . . speed up coupling, gathering and shunting . . . reduce surging, spilling and danger of derailment. National Rubber-Cushioned Draft Gears provide smooth cushioning action that reduces shock and protects equipment.

National Cast Steel Pallets and abrasion-resistant Mallix Sintering Bars last longer . . . reduce equipment down time.

Capitol Foundry Co. and Arizona Iron Works of Phoenix, and Rotary Steel Castings Company of Denver, National subsidiaries, produce castings for mining and milling equipment and specialize in the manufacture of grinding balls.

Specify National products—handle larger daily tonnages at lower per-ton cost.

X-5549

See us at BOOTH 821

National Products will be on display at the Mining Show Denver, Sept. 22—25

NATIONAL Products FOR TRANSPORTATION AND INDUSTRY Est. 1868

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

Cleveland 6, Ohio

Willison Automatic Couplers • Friction & Rubber Draft Gears • Car Trucks • NACO Steel Wheels • NACO Steel Links & Swivel Hitchings

Let's Call Wire Rope Constructions

by their Right Names!

This is a message of importance to every user and purchaser of wire rope. It is information that will help eliminate much of the past confusion over wire rope terminology.

How did this confusion arise? Let's illustrate briefly. For years 6 x 19 has been just a name for a variety of six-strand ropes, few of which actually have 19 wires per strand. As an example, our popular 6 x 19 W has always contained 25 wires per strand; the 6 x 19 U, 21 wires per strand. The 6 x 19 Seale, on the other hand, really does have 19 wires in each of its strands. Until recently, the letter or name following the numbers denoted the actual construction; but many users did not know this, and the omission of these symbols occasionally resulted in costly misapplications.

To clarify matters in the various classes of rope, Bethlehem has revised the entire list of misleading designations. For instance, in the Bethlehem terminology, Type W rope is now designated—accurately—as 6 x 25 W (not 6 x 19); Type Q is 6 x 41 Q (not 6 x 37). This completely accurate terminology applies to each and every rope that Bethlehem makes.

Nothing has been changed but the designation. The ropes are made to the same high standards of Bethlehem quality. *Constructions are the same as in the past.* Only the names, the designations, are different. The numbers now mean what they say.

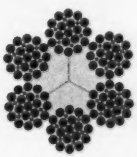
We earnestly solicit your help in publicizing this information. The transition now under way is one that has long been needed.

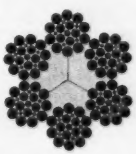
BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

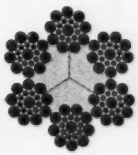
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

6 x 25 Type W | 6 x 21 Type U | 6 x 19 Seale

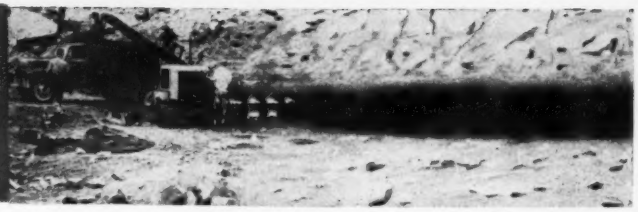






Of these three ropes, Seale is the only one with 19 wires a strand. Yet for years all three types have been known as 6 x 19. This is not an isolated case. Similar instances occur in other classifications of rope.

SALVAGING LOST COAL



● McCarthy Coal Recovery Drills put new profit in worked-out strip mines by recovering clean lump or slack coal without disturbing overburden.

The drills bore horizontally into the heart of the exposed seam to pull out continuous streams of coal from depths of 100 feet and more.

Cost of this operation varies between $1.50 and $2.00 per ton, including amortization of investment. A three-man crew can handle the entire job, including loading.

Rate of recovery depends entirely upon operator skill, bench width, seam thickness and diameter of auger used.

We suggest you write today to determine which of four standard models is most suitable for your requirements.

McCarthy hydraulically controlled Drills are available with 4 to 24-ft. interlocking-auger sections in 20, 24, 30, 36, 42 and 48-inch diameters. Jacks are power operated with power supplied through gasoline, diesel or electric units.

Make it a point to investigate this economical new method for recovering coal right now.

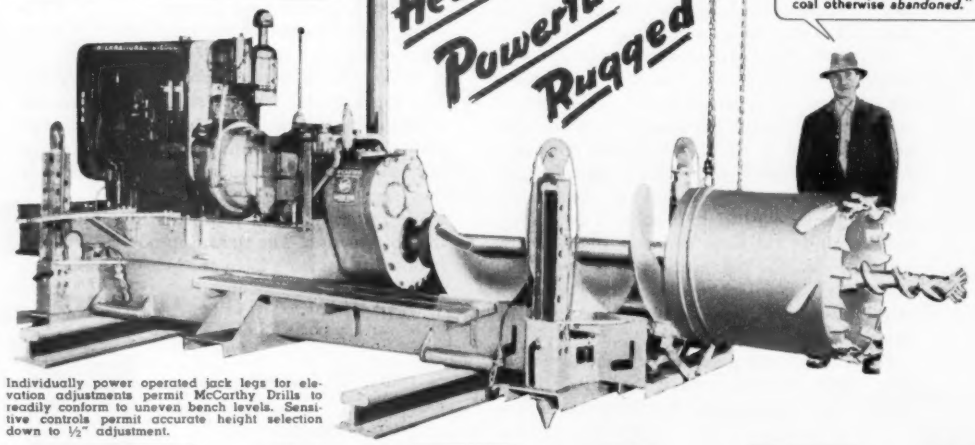
Near Salineville, Ohio, three men, using a single McCarthy Drill equipped with 24-inch augers, get out 90 tons of coal daily. The same number of men, working for the Bruns Coal Company, near Germano, Ohio, use 36-inch auger sections to produce 167 tons per day.

McCarthy Auger Hoist makes easy the handling of individual auger sections to allow fast operation in or out with minimum physical labor.

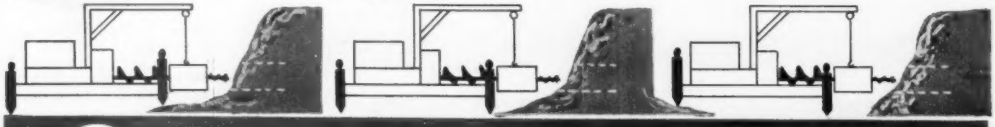
McCARTHY
New 36" Recovery Drill; weight 9,700 lbs.

Heavy Powerful Rugged

"I salvaged 200,000 tons of coal otherwise *abandoned.*"



Individually power operated jack legs for elevation adjustments permit McCarthy Drills to readily conform to uneven bench levels. Sensitive controls permit accurate height selection down to ½" adjustment.



SALEM

THE SALEM TOOL CO.

IN THE DARK

GLOWING **HARD BOILED*** HATS Mean Safety Plus!

GLOWS eight hours after five minute exposure to artificial or daylight. Phosphorescent finish molded into *white* crown. Other models offer unlimited choice of color. Stronger-than-steel-molded Fiberglas gives complete protection, exceeds all government and industrial tests for safety including electrical hazards. Your choice of Hard Boiled hats or caps.

Easy to Wear
Comfortable, full-floating headband assembly allows air to circulate through hat.

"One Size Fits All"
—adjustable headband cuts inventory and insures perfect fit. Headband assembly replaceable in seconds, to restore new hat feel.

EVERYTHING BULLARD IN SAFETY *Tm reg. HARD BOILED

Distributors in Principal Cities

E. D. BULLARD COMPANY
275 EIGHTH STREET, SAN FRANCISCO, CALIFORNIA

NOW up to 22% more payload capacity per dollar

MATCHED FOR EXTRA PROFITS
Rugged new St. Paul dump bodies are perfectly "teamed" for maximum output with the new extra capacity St. Paul hoists. They're huskier, tougher.

Check St. Paul before you buy!

Whether you need a single standard duty body hoist, or a fleet of heavy duty twins, you'll get *more payload capacity per dollar, per pound of weight in the new St. Paul line.* This is because St. Paul — pioneer builder of the first hydraulic hoists 40 years ago — has "scooped" the industry again with *over 50 advanced engineering improvements no other hoist can match.* See these great new 6 to 31-ton capacity hoists and matching dump bodies at your St. Paul Distributor today, or write direct for free literature.

ALL NEW for '52!

QUICK FACTS

1. New "center-push" design means easier lifting, reduced hinge loads.
2. New equi-lift strut arms eliminate uneven stresses, prevent binding.
3. New tapered cylinder head reduces mounting height, increases leverage up to 25%.
4. New uni-flex subframe provides more strength with less weight.
5. New friction-free pump assures added power, lower oil pressures.

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St. Paul HYDRAULIC

ST. PAUL HYDRAULIC HOIST
Customer Service Department
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5-HBC-2

63 years

of progress and achievement

In 1889, Dr. J. B. F. Herreshoff, under the sponsorship of Dr. William Henry Nichols, a charter member of the American Chemical Society, chemicals manufacturer and refiner of metals, developed the first circular, multiple hearth roasting furnace of American design and manufacture. This five hearth, 8' diameter furnace was used for the roasting of pyrite for the manufacture of sulphuric acid.

In all of the sixty years that have elapsed since the first furnace was constructed, the Nichols family has been closely connected with the development and manufacture of thermal processing equipment for the chemical and allied industries. Today, several thousand multiple hearth type furnaces bearing the names Nichols and Nichols Herreshoff are in use throughout the world; some single units capable of processing up to five hundred tons of material in twenty-four hours.

In 1931 Charles Walter Nichols, son of Dr. William Henry Nichols, organized the Nichols Engineering & Research Corp. and became its chairman. Mr. Nichols and his son, C. W. Nichols, Jr., President, are devoting their leadership to the continuation of the design, development and construction of thermal processing equipment, proud of their association with the steady growth of industry.

Dr. William Henry Nichols
(1852-1930)

Mr. Charles Walter Nichols
Chairman

Mr. C. W. Nichols, Jr.
President

NICHOLS EQUIPMENT

Multiple Hearth Furnaces (Herreshoff and Wedge) • Nichols Freeman Vortrap* Classifiers • Nichols Freeman* Flash Roasters • Nichols Tubular Coolers • Nichols Industrial Waste Incinerators • The Reener Screen • Sewage Sludge Dryers and Incinerators • Nerco Tower Dryers • Nerco-Niro* Spray Dryers • Nichols Bark Burning Furnaces • DWIGHT-LLOYD* Sintering Machinery • Pelletizer-Mixers • Transportometers* • Transportoweighers* • Transportofeeders*

* Reg. U.S. Pat. Off.

NICHOLS
Engineering & Research Corp.

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INCREASES THE LIFE OF SMELTER BAGS

FUMEALL filter fabric is saving money for many of the world's largest smelters. Actual operational studies show that **FUMEALL** which costs but little more than any other good all-wool filter fabric, lasts up to four times as long.

FUMEALL a combination of virgin wool and Dynel, combines the undisputedly superior filtering qualities of wool with the strength, heat, acid, alkali and moisture-resistance of synthetic fibers.

FUMEALL is available in the exact porosity and weave which meet your specific requirements.... **FUMEALL** can be ordered as yardage or can be fabricated into bags of any size and specification.

Please write for additional details and samples of FUMEALL *filter fabric for fume, dust or liquid filtration.*

INDUSTRIAL FABRICS DIVISION

Portland Woolen Mills, Inc.

P.O. Box 2620 • Portland 3, Oregon, U.S.A.

Let's Talk it Over in Denver

Bring us your dust problems—we'll show you the equipment to solve them

AAF is setting up this "dust clinic" at your Exposition in September. Here you will find full scale working models of both the Type N and Type W Roto-Clone* dust control units, Cycoil Oil Bath Air Cleaner and the Multi-Duty Automatic Air Filter.

And waiting to talk with you will be a complete staff of AAF dust engineers—men qualified by experience to discuss this equipment in terms of mining operation.

Whether your problem involves dust control of any one of a dozen mining operations or supplying clean air to engines and compressors, we'll be waiting for you at Booth 110-114—with a practical solution.

**ROTO-CLONE is the trade-mark (Reg. U.S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydrostatic precipitator types.*

AAF American Air Filter

COMPANY, INC.

193 Central Avenue, Louisville 8, Kentucky

American Air Filter of Canada, Ltd., Montreal, P. Q. • Pacific Division Office, San Francisco, California

*QUARTER-MILE ROADBED...sun-baked, ice-swept...*YET STILL ON THE MOVE AFTER 14 YEARS OF COAL HAULING SERVICE!!!

Photographs may not lie; but, here's one that falls far short of telling the whole truth about the remarkable performance records chalked up by this Republic Rubber's Coal Handling Conveyor Belt.

But, then it's quite a story! You can see for yourself there's lots of sky overhead and that means sun . . . constant, unrelenting sun beating down on the conveyor belt surfaces, until seasonal changes bring about onslaughts of rain, snow and sleet.

The load, of course, is coal . . . an abrasive, mine run coal that's dropped through chutes and carried by the belt to stockpiles located throughout the dock area.

With these facts in mind and knowing that when the ship moves out, there's nothing to protect the belt against spraying lake water, consider this:

The belt is now fourteen years old and still going strong!!!

Purposefully, we've left the photo unretouched to show you just what a 14-year old Republic Rubber Conveyor Belt really looks like . . . to show you just how well a Republic Conveyor Belt stands against the ravages of time, hard labor and all the elements can throw at it. Incidentally, the dark spots you see on the belt's surface aren't worn places at all. That's water . . . water that makes ordinary conveyor belts mildew and prematurely fail, but holds few terrors for Republic Conveyor Belting because they're "mildew-proofed"!

It's to your advantage to learn why Republic Conveyor Belts like this can year in, year out, many times outperform and outlast other brands of belting.

Despite abrasion, impact, flexing, weathering or contact with heat, oil and chemicals, Republic Conveyor Belts continue to be your best insurance against breakdowns, short life and high handling costs.

Write us today for the name of your local Republic Rubber Distributor who can offer expert advice and fast service on all industrial Rubber Products.

Remember, whether it's hose, belting, packing or any one of hundreds of different molded and extruded specialties . . . **if it's built of rubber, Republic builds it better!**

REPUBLIC RUBBER DIVISION

LEE RUBBER & TIRE CORPORATION, YOUNGSTOWN 1, OHIO

INDUSTRIAL RUBBER PRODUCTS

ON TARGET!

ACME

MINE COMPRESSOR

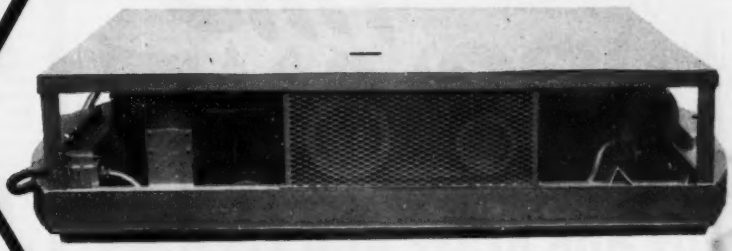
DEPENDABILITY

TROUBLE FREE

LONG LIFE

COMPACT

LOW MAINTENANCE



Track gauges adjustable from 42" to 48". Height 30", length 136", rail clearance 3", wheel base 48", width 66½".

- Loadless starting
- Full forced-feed lubrication
- Low oil pressure shut down—high temperature shut down
- Air cleaners featuring both oil bath and air scrubbers

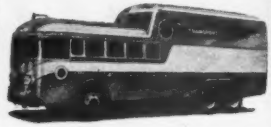
AVAILABLE IN 4 NEW MODELS

130 CFM
168 CFM
210 CFM
275 CFM

Immediate delivery. Available on any type mounting.

ACME MACHINERY CO.

ACME 1169—WILLIAMSON, W. VA.—PHONE 1234



THE NORTHERN PACIFIC TRANSPORT COMPANY

. . . a very prominent western transportation company, operates a large number of motorized vehicles in the states of Montana and Washington. The operation of their equipment is extremely severe due to mountain grades and wide temperature variations.

They say . . . "THIS LUBRICANT CUT OUR PARTS REPLACEMENT 50%"

Quoting from their letter of October 17, 1949:

"We ran our first test on LUBRIPLATE #22 in March, 1945, in 3000 series Timken tandem-drive, worm axles. That year we experienced considerable trouble with wartime drivers and very poor roads, causing us no end of trouble. The oil that we were using set up to tar in 10 to 15 thousand miles. The LUBRIPLATE #22 proved so satisfactory we installed it in all our worm-gear, hypoid, and two speed axles. This enabled us to change our oil-change period from 15,000 miles to 40,000 and on some applications, depending on speeds and temperatures encountered, we raised the change period to 60,000 miles, or approximately once a year. Our overhaul periods were stretched from 50,000 to 100,000 miles, and repair parts bill cut 50% with the increased mileage."

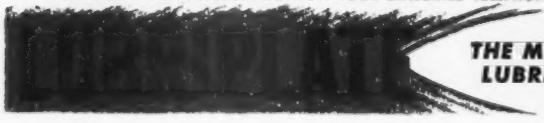
Naturally with the economies that this company enjoyed through the use of LUBRIPLATE Lubricants on worm-axles, they extended the use of LUBRIPLATE to other parts of their equipment. The savings in parts, time, money and increased efficiency are equally startling. Let us send you the entire report of where they are now using LUBRIPLATE and what it is saving them.

LUBRIPLATE Lubricants will prove just as effective for you in your plant in reducing friction and wear. They are different from any other lubricants you have ever used. They save power, prevent rust and corrosion and definitely arrest progressive wear.

LUBRIPLATE Lubricants are available from the lightest fluids to the heaviest density greases. There is a LUBRIPLATE Product best for your every lubrication requirement. Let us send you CASE HISTORIES of savings that others in your industry are making through the use of LUBRIPLATE Lubricants. Write today.

LUBRIPLATE DIVISION
Fiske Brothers Refining Company
Newark 5, N. J. Toledo 5, Ohio

DEALERS EVERYWHERE . . . CONSULT YOUR CLASSIFIED TELEPHONE BOOK



CONNELLSVILLE (LEPLEY) Safe MINING EQUIPMENT

Economical-Rugged!

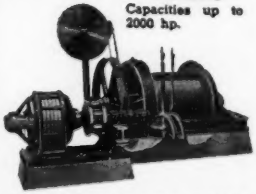
MAN CAGES
Single or double deck types. Capacities from 1 to 90 men.

BOTTOM DISCHARGE SKIPS
Built to "take it" in 1 to 25 ton capacities.

SKIP LOADING CHUTES
Operated either by skips or air cylinders. Toggle locked when closed.

SHEAVES
Bicycle type with renewable special steel liners. Up to 16 ft. dia. with plain or anti-friction bearings.

ELECTRIC HAULAGES
Capacities up to 2000 hp.



WRITE FOR COMPLETE DETAILS

We specialize in all types of equipment to meet your needs

CONNELLSVILLE
MFG. & MINE SUPPLY CO.
CONNELLSVILLE, PA.
"Serving the Mining Industry Since 1901"

REG. U. S. PAT. OFF.

Kleenslot

Wedge-Wire VIBRATOR SCREENS

(PAT. APPLIED FOR)

THEY CAN BE DESIGNED AND ADAPTED TO FIT ANY MAKE OF VIBRATOR. It is not necessary to change your present machine to accommodate our screen.

KLEENSLOT WEDGE WIRE VIBRATOR SCREENS are of quality construction and built to give maximum long-life service. The rigid construction and method of installation prevents "whipping".

The wedge shape of the screen wire with its non-clogging, non-blinding features permits perfect separation on wet or dry screening and the rigid construction adds considerably to its capacity and efficiency when used in vibrator applications. These added features have been proven in hundreds of installations and are continually gaining in popularity throughout the industry.

Remember, it costs nothing to obtain a Wedge Wire recommendation for your plant. We will consider every phase of the application and offer you a "tailor made" screen to exactly fit your needs.

Like all Wedge Wire engineered products these two screens can be furnished in mild steel, stainless steel, monel, nickel and aluminum.

Wedge-Wire SCREEN GUARDS

(PAT. APPLIED FOR)

THEY'RE DIFFERENT AND THEY'RE NEW

Here is a screen guard, also for use on vibrators, that is a brand new innovation in the mining and industrial fields. It is particularly adaptable for use in flumes.

Inasmuch as the screen guard is built right into the screen, as shown in the photograph at left the vertical guard bars keep the larger lumps of material above the guard bars permitting only the finer particles to pass over the screen and gives much greater efficiency in dewatering.

Wedge Wire screen guards can be furnished in special sizes to your requirements in practically any type of long wearing metal. They are made to close tolerances like all Wedge Wire products,—the width of each wire is held to plus or minus .002 to insure uniform opening width. All Wedge Wire features are embodied in these screen guards and it is to your advantage to consider them from the standpoint that they are non-clogging, non-blinding, strong, rigid, uniform and more economical in the long run.

Cross section at left shows how KLEENSLOT Screens operate on a non-clogging, non-blinding principle.

SEND FOR ILLUSTRATED LITERATURE TODAY!

WEDGE-WIRE CORPORATION

5602 CLARK AVENUE

CLEVELAND 2, OHIO

POWER UP —
POWER DOWN
Loads up to 30 tons raised to 70° high-dumping angle, for fast, clean dumps
HEAVILY REINFORCED BODY DESIGN
Box-member ribs provide stamina needed to stand up under heavy loads of rock and ore

Just 2 advantages of
HEIL Double-Acting Twin-Arm Hoists and Rock Bodies!

THERE are many good reasons why your Heil Dump Unit delivers pay-off performance . . . why it can take a beating and come back for more:

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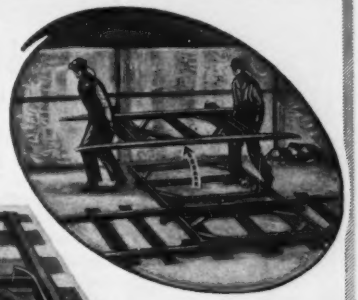

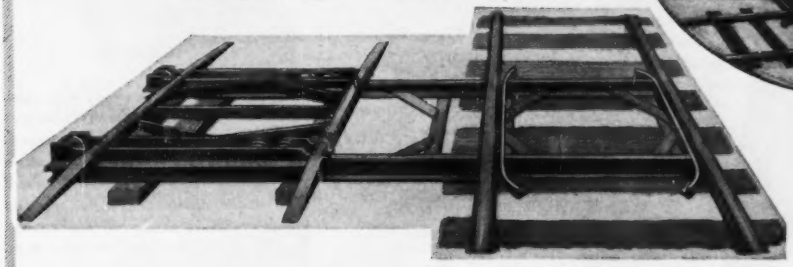

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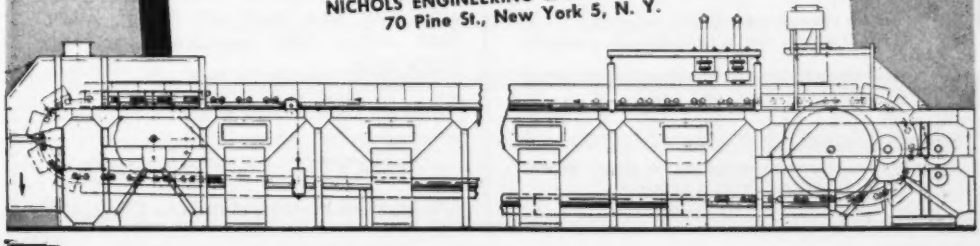

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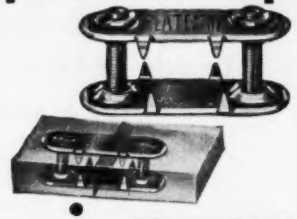
PLATE FASTENERS FOR CONVEYOR BELTS



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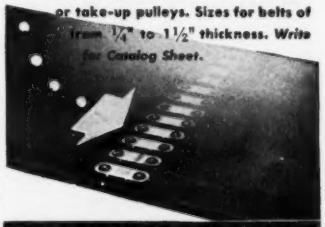

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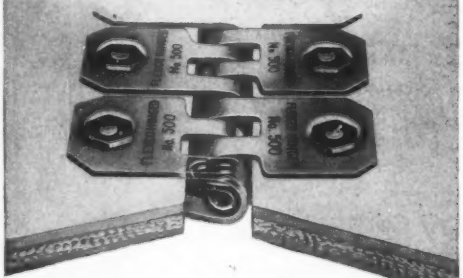

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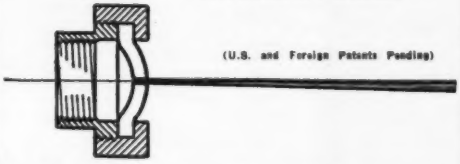

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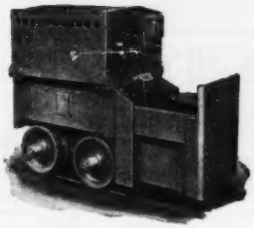

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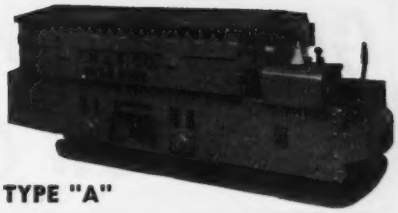

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The Atlas Type "A" is a low cost, trouble free locomotive for main line service. Rugged, heavy duty construction enables top production schedules to be maintained. Type "A" is equipped with Atlas Double-Reduction Spur Gear Drive. Furnished in 3 and 4 ton and larger sizes.

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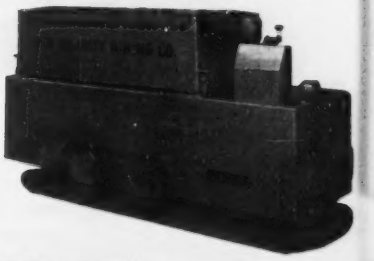

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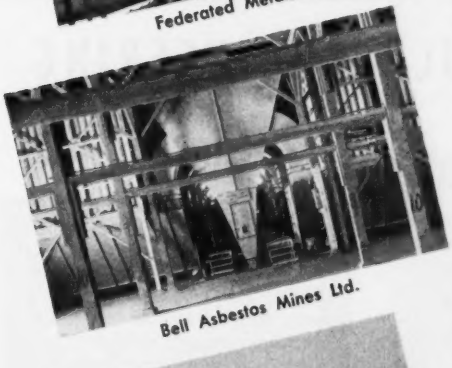

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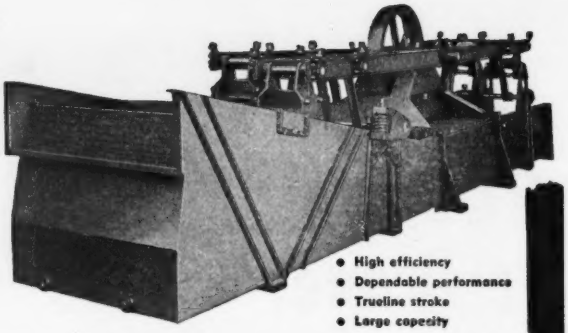

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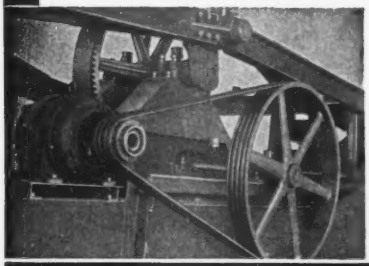

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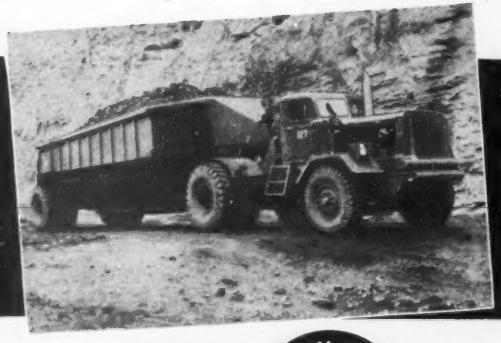

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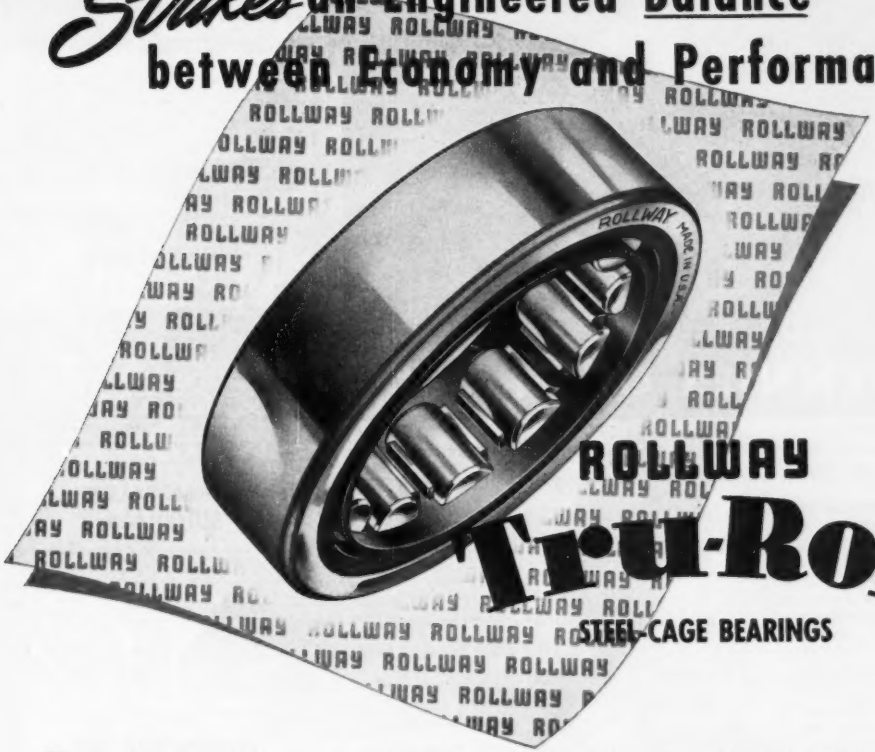

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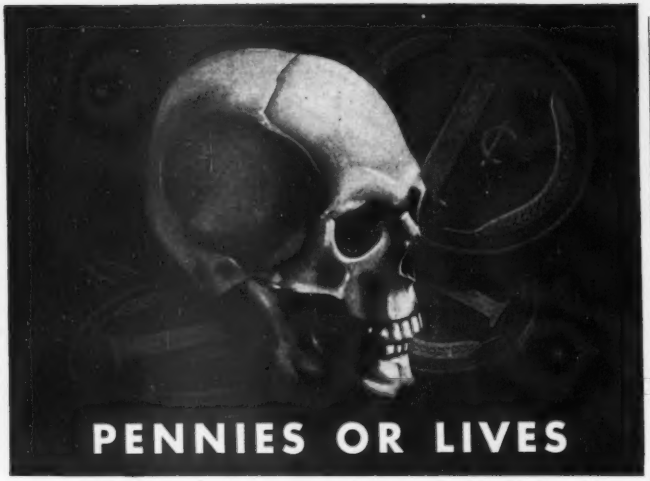

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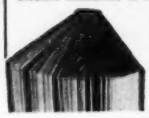

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Bridging the gap between Heavy Media and Flotation, the Humphreys Spiral Concentrator provides a low cost method for recovery of values between ⅛" and 200 mesh.

★ *for* separation of minerals of different specific gravity in ores at sizes generally minus 10 mesh.

★ *for* recovery of liberated values too coarse for flotation.

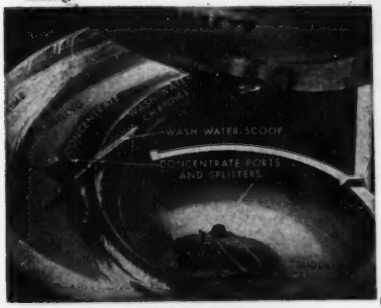
★ *for* recovery of other ore values from flotation tailing.

★ *for* recovery of values too fine to be economically treated by heavy-media separation.

★ *for* cleaning minus ¼ inch bituminous or anthracite coal.

Low cost of installation
Low operating costs
No moving parts

Concentrating action of Humphreys Spiral—Note wide black band of concentrate entering upper outlet, which is set for a wide cut, also narrow black band of middling entering lower outlet set for thin cut. In cleaning fine coal, phosphate rock and mica, refuse and middling are discharged from the concentrate ports and cleaned product follows the path shown as tailing.



The installation, operation and maintenance costs of Humphreys Spirals are so low that economical concentration of materials, which could not heretofore be worked at a profit, is now possible. There are no moving parts, no vibration, weight per unit of capacity is low and requires only a light foundation. Floor space per ton treated is very small.

HUMPHREYS SPIRALS are widely used in plant operations in the United States and abroad, ranging from 30 tons to 20,000 tons daily capacity, for concentration of fine iron ore; for concentration of chromite, ilmenite, rutile, and zircon from sands; for concentration of ground ores for recovery of lead, zinc, chromite, copper, barite, mica; for concentration of molybdenum flotation mill tailing for recovery of tungsten; for separation of fine phosphate rock from sand; for cleaning minus ¼ inch coal; for concentration of pyrite from flotation mill tailing; for concentration of fine gold and gold bearing minerals.

A testing laboratory is maintained in Denver by the Engineering Division of The Humphreys Investment Company. Results obtainable in a full size plant may be determined by tests of a representative sample of minerals or coal weighing 300-500 pounds.

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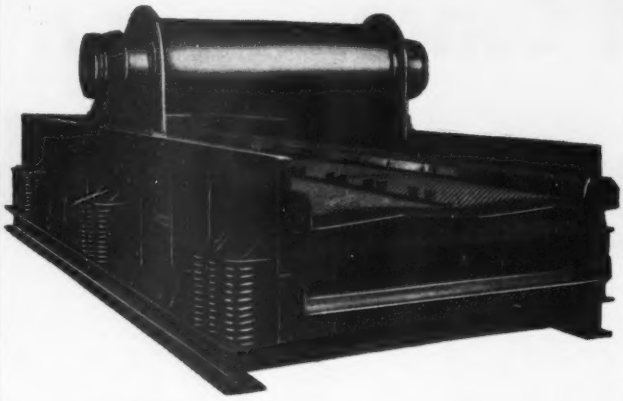
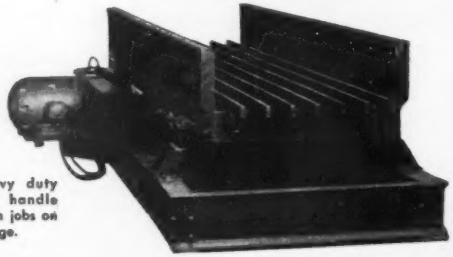


SIMPLICITY gyrating screens are doing a fast, efficient sizing and dewatering job for the metal mining industry

The 6' x 20' Simplicity Model OM Double Deck Screen shown here is typical of Simplicity Screens used successfully at the great Mesabi Range in Minnesota to size and dewater iron ore. This screen, with a ⅝" opening on the top deck and a 1½mm. dewatering surface on the lower deck, is designed for heavy media concentration of iron ore.

Throughout the metal mining industry, Simplicity equipment is handling all types of preparation work from coarse scalping to fine screening and dewatering. Simplicity operating mechanism insures fast, accurate sizing and keeps production costs down.



Simplicity heavy duty scalpers also handle tough production jobs on the Mesabi Range.

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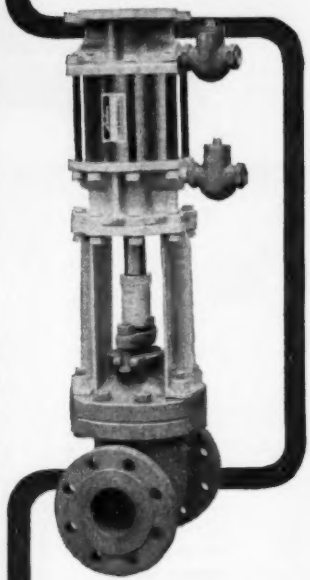

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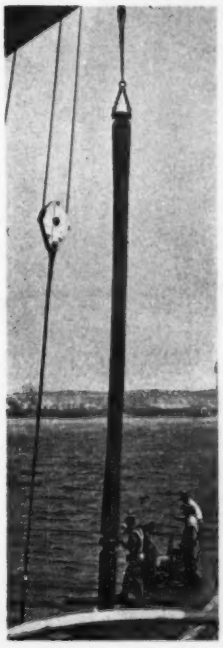
PIONEER

This Pioneer Hose is still young after *seven years* on the ocean bottom



Pioneer's Submarine Hose regularly spends seven to eight years on the ocean bottom at Richfield Oil Corporation's Elwood (Calif.) Terminal, and during that time conveys millions of barrels of gasoline from ship to shore. Even then, this hose is not ready for retirement. One used length was installed as an experiment at another Richfield Terminal, and it shows no signs of giving up today *after four years of extra duty!*

Pioneer Submarine Hose has been used at the Elwood Terminal since its opening in 1928. Eight lengths are attached to a pipeline extending almost 4,000 feet seaward. After a tanker is moored, the end of the hose is raised and pumping begins. Crude was originally pumped to the ships at 6,000 barrels an hour, but operations have recently been changed to the discharge of gasoline at about 4,000 barrels an hour. Seven and more years of service on such duty is truly remarkable.

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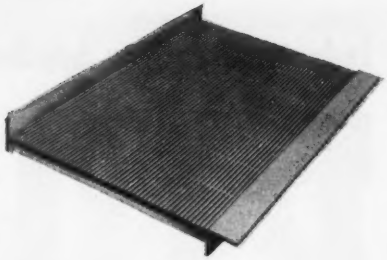
New types of screens for ore processing



For more efficient drainage, wet screening and heavy media recovery operations, Hendrick has developed two new types of heavy-duty Wedge-Slot Screens.

The profile bars (C-12 and CH-12) for these screens have their head flanges so designed that uniform width of slot opening is maintained until the entire head of the bar is worn down. Preparation plants in the iron range using these types of profile report that the screens have been used for a full season of continuous processing without requiring any maintenance or repair.

Both types are of similar design, but CH-12 has an extra large head flange to provide maximum resistance to abrasion on jobs with especially heavy loads of abrasive material.

If you will let us know what performance you are getting from your present equipment, we shall be glad to suggest how Wedge-Slot Screens might be utilized to advantage to increase production and minimize down time.

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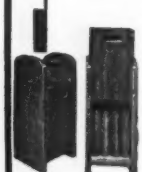

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These poles are made of straight grained wood and are coupled together with removable wood pins held in place in recessed grooves by a rubber band and can be quickly connected and unconnected.
Couplers and Head Blocks are 4, 5 and 6 inches in diameter. Please specify size when ordering. Poles are 1½" in diameter.
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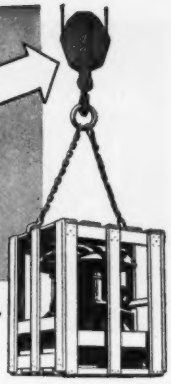

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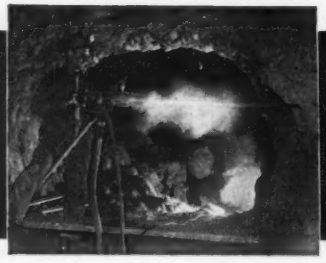

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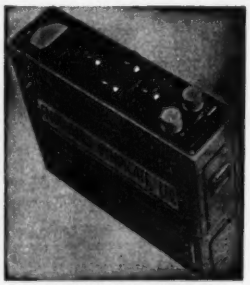

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FIRST CLASS Mill Metallurgist to work directly under Assistant Superintendent and be in full charge all testing and research large copper concentrator Chile, South America. Graduate engineer required with experience in operation milling plants using crushing, grinding and froth flotation, etc. 3-year contract. Transportation both ways and salary while traveling paid by Company. In reply give complete details. P-5181, Engr. & Mining Jrl.

FOUNDRY ENGINEER Wanted, large nonferrous smelter and refiner. State training, experience and references in first letter. P-5224, Engr. & Mining Jrl.

MECHANICAL ENGINEER to assist in supervision maintenance of fleet of Whitcomb Diesel Electric Locomotives, as well as general railway repair shops, large copper company Chile, South America. 3-year contract. Transportation both ways and salary while traveling paid by company. In reply give complete details. P-5178, Engr. & Mining Jrl.

Continued on page 264

SALES ENGINEER

Salaried position for engineer experienced in ore dressing or coal preparation. Permanent position with leading equipment manufacturing and engineering construction firm. Submit details of experience, age, salary required and starting date. All replies strictly confidential.

P-5215 Engineering & Mining Journal
520 N. Michigan Ave., Chicago 11, Ill.

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P-5211 Engineering & Mining Journal
520 N. Michigan Ave., Chicago 11, Ill.

WANTED — RESEARCH METALLURGIST

Not over 45 years old with excellent technical and practical experience in flotation, concentration, copper leaching, for long established large East Mediterranean copper pyrite mill. We offer three year contract; single status 6 months; 3 months' paid vacation at contract end. Free housing; California climate; pension plan noncontributory. All travel expenses self and family; children not over 12 years old. Must pass life insurance physical. References required; also photo, complete personal history and minimum acceptable salary.

P5081 Engineering & Mining Journal
1111 Wilshire Blvd., Los Angeles 17, Calif.

POSITIONS VACANT
(Continued from page 263)

YOUNG CIVIL Engineering Graduate with some experience in maintenance of track and track equipment for Railroad Department large Copper Company Chile, South America. 3-year contract. Transportation both ways and salary while traveling paid by company. In reply give complete details. P-5173, Engr. & Mining Jrl.

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GEOLOGIST—MINING Engineer, age 34, 10 years experience geology, explorations, mine operations and engineering in western and central states. Presently employed as mine superintendent and acting manager for major company. Available 30 days notice. PW-4861, Engr. & Mining Jrl.

GRADUATE MINING Engineer, Executive, 50, wishes Management or Executive position. Long experience in Canada and overseas. PW-5220, Engr. & Mining Jrl.

METALLURGICAL ENGINEER, Approximately 15 years overall experience in teaching, research, and metallurgy and related fields. Desires department headship and/or professorship in a school of mines. PW-5085, Engr. & Mining Jrl.

MINING ENGINEER—36, married. 13 years' experience in underground mining operations, exploration, production, development, mine valuation, cost estimation, job evaluation. Registered Professional Engineer. Employed. Available reasonable notice. PW-5072, Engr. & Mining Jrl.

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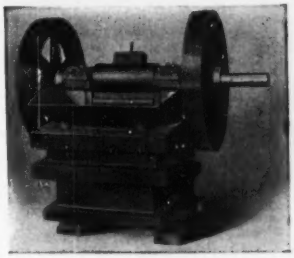

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16"	4	1/8"	1/32"	28 Oz.
18"	4	1/8"	1/32"	28 Oz.
20"	4	1/8"	1/32"	28 Oz.
20"	5	1/8"	1/32"	28 Oz.
24"	4	1/8"	1/32"	28 Oz.
24"	5	1/8"	1/32"	28 Oz.
26"	5	1/8"	1/32"	28 Oz.
30"	4	1/8"	1/16"	32 Oz.
30"	5	1/8"	1/16"	32 Oz.
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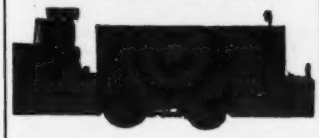

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Total Weight, including Battery	6	Tons
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Radius of Minimum Curve	12	Feet
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1—18" Denver Cone Type Dry Reagent Feeder
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COMPRESSORS: Worthington DC2, 28/18-½ x 21, motor 600 H.P. synchronous, 440 volt, with all auxiliary equipment. 4—Ingersoll Rand model XVA, built 1950, cap. 1035 CFM, 200 H.P., 2200 volt, A.C. motors with all auxiliary equipment, NEW condition.
MOTORS: 2—NEW G.E., Tri-clad, drip proof, 1000 H.P., 1800 RPM, 2300 volt, with automatic controls.
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CRUSHER, GYRATORY: Telsmith 16-B, all steel, opening 16 x 74", 75 H.P. motor, V-belt.
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DRYERS or KILNS: 2—10 ft x 60 ft. heavy duty, with or without auxiliary equipment, condition like NEW. Located Minnesota. 1—10 ft. x 25 ft. and 1—5 ft. x 30 ft.
CLASSIFIERS: 2—Akins 54" double pitch, single screw, weir type, 3 H.P. synero-gear motor, 220/440 volt, lifting device 1½ H.P. 2—Akins and Wemco 78" double pitch, single screw, weir type, 7½ H.P. motors, 220/440 volt, speed reducer and lifting devices. Three of above located near Reno, Nevada.
1—Dorr 8 ft. x 30 ft. rake, 22 ft. dia. bowl, with motor and drive. New 1951, slightly used.
PULVERIZERS: One Marcy Red Mill 8' x 12' and one 5' x 14' manganese lined, with 350 H.P. motor and drive. Hardinge Mill 5' x 22', manganese lined for dry grinding, complete with 30 H.P. motor, 220/440 volt, and feeder.
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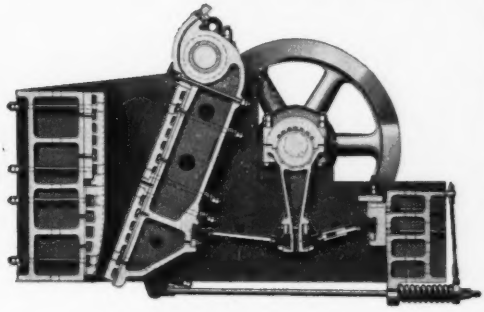

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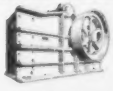
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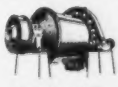
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